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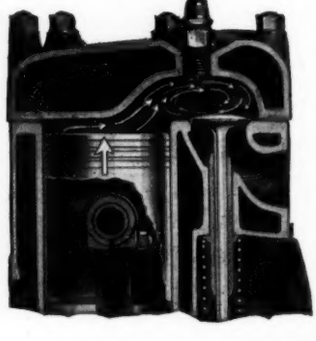

Waukesha Motor Co.

Engine Builders

Waukesha **Wis., U. S. A.**

New York, N. Y.

AUTOMOTIVE INDUSTRIES
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VOL. 51 NEW YORK—THURSDAY, AUGUST 7, 1924 No. 6

Are Your Dealers Asking "What's Coming Next?"

Consistency in sales policies is needed. Uncertainty among retailers tends to destroy confidence and stability.

By Norman G. Shidle

FOR a long time dealers have protested against the forcing upon them of car allotments which the market was not ready to absorb. In the early months of this year their protests were stronger than ever before. Some of them kicked pretty hard and if the practices of the past had been adhered to in certain cases conditions might have become critical, indeed.

But manufacturers on the whole heeded the warning signals and the retailers have been given a good chance in the last two months to clear away their new car stocks. As a result the entire economic position of the industry has been bettered materially.

All of which is fine, but says the dealer to himself, "Will they do it again? Will they refrain from loading me up the next time the business curve takes a drop?"

Dealers are fairly well satisfied with the relation between factory shipments and retail sales at the present moment, but they still are uncertain about the future. Dealers as a whole are not in an entirely satisfied frame of mind. They have had some unfortunate experiences in the last year or so and the "I'm-from-Missouri" attitude is rather prevalent.

This psychological condition can be altered in only one way—by a long period of fair dealing between factories and retailers which will reestablish the mutual confidence that has been lost in some cases.

The difficulty with factory sales policies in the past often has not been in any improper methods of operation, but in lack of consistency. Time and again the basic merchandising policy of a factory has been altered almost overnight with the result that the dealer organization sometimes doesn't know what to expect from one minute to the next. In business that grows and changes as rapidly as does the automotive industry, a factory can hardly be expected to have a perfect marketing system or a policy which will not need change and modification from time to time. But certain fundamentals can be laid out which will be characteristic of the policy of a particular company year in and year out. When this is the case the dealers can plan for the future with confidence because they know from past experience what sort of factory action to expect under almost any given circumstances. When factory policy changes frequently, however, the plus value engendered by such confidence is difficult to obtain.

Dealers don't like to tie up any more capital than is absolutely necessary; for example, in parts stocks. Every time a retailer hears about a new model being on its way,

UNCERTAINTY!

The manufacturer who can remove uncertainty from his dealers' minds gives impetus to his sales and improves the desirability of his contact very greatly.

Stability in factory sales policy from year to year is the only thing that will do the trick. The success of those companies whose marketing methods have been practically the same over a long period of time proves the value of consistency.

therefore, he begins to worry about having to carry a bigger parts inventory. Some factories have removed this source of worry by adopting a similar policy year after year. An important distributor for one such manufacturer, for instance, showed his state of mind when he said the other day:

"As regards the large stocks of parts dealers may have to handle because of rapidly changing models, I am glad to say that the Blank car has never been a burden in this respect. In designing new models this company always has tried to design so that the same parts used in old models would fit the new line. For this reason we are able to run over our parts stock quickly and constantly. In three years my parts stock has increased only about $5,000 despite a constantly increasing gross business."

That statement is a good example of what consistency in policy will accomplish in keeping the dealer satisfied and in providing for him conditions under which he can make a profit.

Changes in policy as regards territorial restrictions have been particularly numerous in recent years. The fairly large restricted territories given to dealers or distributors a few years ago are not nearly so common as they once were. The opposite extreme has been reached in the case of many low-priced lines. Territorial restrictions have been removed entirely, and numerous sub-dealers and associate dealers have been given franchises. So far has the pendulum swung in this direction that dealers in low-priced lines have found it difficult to make profits in many urban centers because of the competition developed with their own sub-dealers.

UNCERTAINTY prevails in the mind of the average dealer about many merchandising questions which are affected by factory action. Among these are:

- Size of territory
- Number of sub-dealers required
- New model announcements and old car stocks
- Parts inventories and new models
- Discounts
- Car allotments

Close students of automobile distribution are looking for a swing back toward fewer retail distribution points in the big cities. The theory was prevalent a year or two ago that sales were certain to increase in direct proportion to the number of retail outlets. As a result every effort was made to multiply the numbers of dealers as rapidly as possible, regardless of the effect of the new dealers on the profits of the old.

Experience disproved the formula. It worked all right up to a certain point, but when profits per dealer began to diminish, the rule didn't hold good any longer. It has developed that one phase was left out of the original formula; that phase was "profit making." The new rule reads that "Sales will increase in direct proportion to the number of profit-making retail outlets." On this basis it is expected that dealer organizations will be adjusted in the future.

But while the makers of some low-priced cars have been having trouble with their retail organizations because of too many dealers in certain areas, many builders of higher priced cars have been suffering from lack of enough distribution points, especially in rural and semi-rural territories. Many manufacturers in this group have come to the conclusion that their chance for future success lies in getting a greater number of active dealers in the smaller towns. They know that there is a good market in these places for their relatively high-priced products, but that the number of possible sales is not large enough to support a good dealer unless he handles some lower priced line or various other kinds of automotive equipment.

The problem before this type of manufacturer is: "How can we get dealers and how can we keep them active after we have them?" The question cannot be answered easily, but it can be answered by consistent effort to reach small-town dealers through advertising, through intelligent educational effort after a contact has been established, and through a consistent sales policy after a contract has been signed.

Different ways of setting dealer quotas are used in different factories, as might be expected. But a lot of trouble is caused by the fact that the same factory often uses a different basis of calculation from year to year. Only two years ago the sales manager of one very large manufacturing company said that he set dealer quotas by adding 10 per cent to the number of cars sold by the particular dealer in the preceding year. Such a method failed to take into account, of course, the fact that the industry could not be expected to continue at the same rate of growth as in the past, and that local as well as general conditions change from year to year.

More complete methods are used in a good many factories, but even today the setting of quotas is on a catch-as-catch-can basis in more than one organization. A quota is supposed to be a standard of measuring performance, and unless it is carefully set up so as to take into consideration everything that reasonably can be expected to affect sales, it is likely to cause trouble. Particularly is this the case when the dealer cannot tell from year to year what basis the factory is going to use in allotting cars to him, let alone predict the actual number he is likely to be called upon to handle. Under these conditions, uncertainty as to the fairness of the quota often arises, whereas a good bit of trouble has been avoided by those factories which have pursued a more or less stable policy as regards car allotments from month to month and from year to year.

Plenty of dealers and distributors are not enthusiastic about the introduction of new models every year. One of their big objections is that nearly always their prospects are aware that an announcement is coming some weeks before it actually arrives.

The dealer is confronted with a very practical problem in such a case. If he were sure that he would have plenty of time to clear his floors before the new model was announced he wouldn't be so much worried. A good many factories in recent years have taken good care of their dealers in this respect, others have not. Some have handled the matter satisfactorily one year and unsatisfactorily the next. Consequently the element of uncertainty enters into the new model question as well as into other dealer-manufacturer relationships.

Uncertainty!—the one big thing the manufacturer wants to get out of the dealer's mind.

In every phase of dealer relationships the establishment of confidence is the most important need at present. Consistency of policy, as is witnessed by several outstanding examples in the industry, is one of the most effective means of establishing that confidence which leads to permanent stability.

New Q. M. C. Trucks Drive on Four or Six Wheels

Rear axle brakes run in oil and have lining attached to drum. Winch, driven off secondary gearset, is located entirely below frame. Units employed include Andrade self-locking differential, Covert gearset and Hinkley engine. Universal helps in steering.

By Herbert Chase

WELL worked out designs of Army trucks for driving on four or six wheels, respectively, prepared by the Engineering Section, Motor Transport Division of the Quartermaster Corps, U. S. Army, under supervision of Chief Engineer A. W. S. Herrington, are receiving favorable comment by engineers who had an opportunity to inspect them during the recent summer meeting of the Society of Automotive Engineers. These two and three-ton vehicles are intended for operation on pneumatic tires. Although designed primarily for Army service, they incorporate a number of features of considerable interest in commercial service.

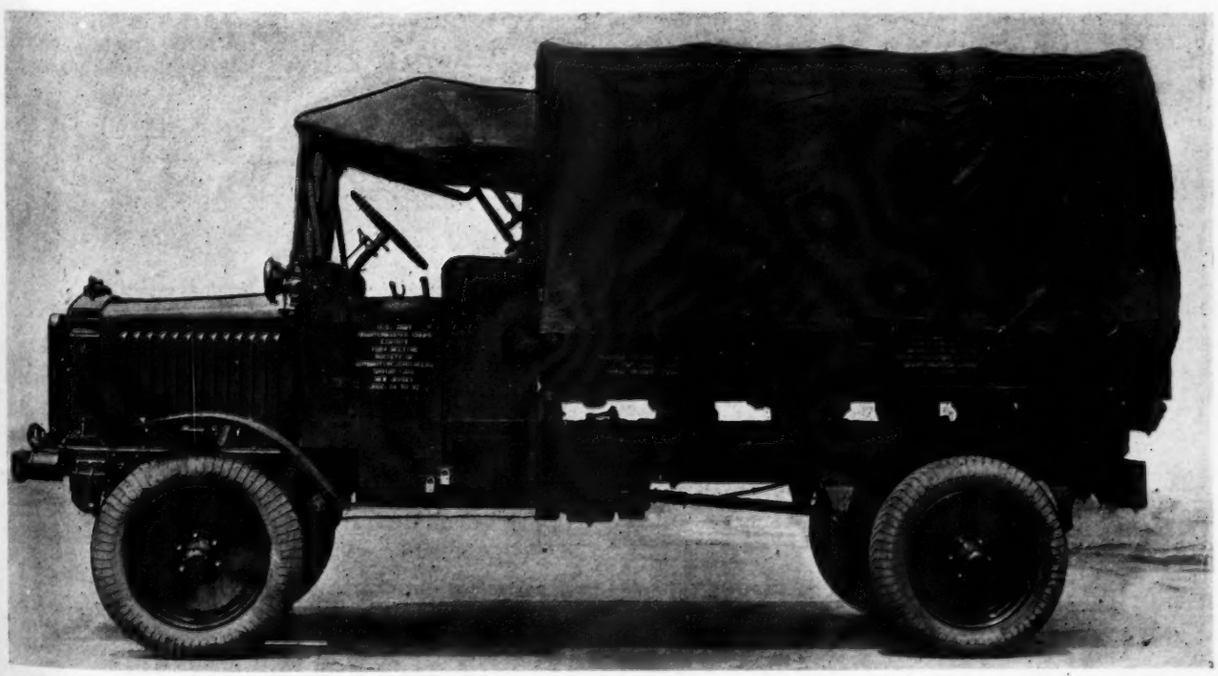
Among these may be mentioned rear wheel brakes which are fully inclosed and operate in oil, an unusual design of winch located so that it is not in the way of any form of body which may be required, seat, dash and top units which are easily and quickly removable, and a compact form of bevel gear drive to the front wheels.

So far as practicable in a somewhat unusual design, standard units are employed, but axles and a number of other parts necessarily are special. Several of the front and rear axle components are interchangeable, however, and other special efforts have been made to reduce servicing problems to a minimum and to secure maximum accessibility.

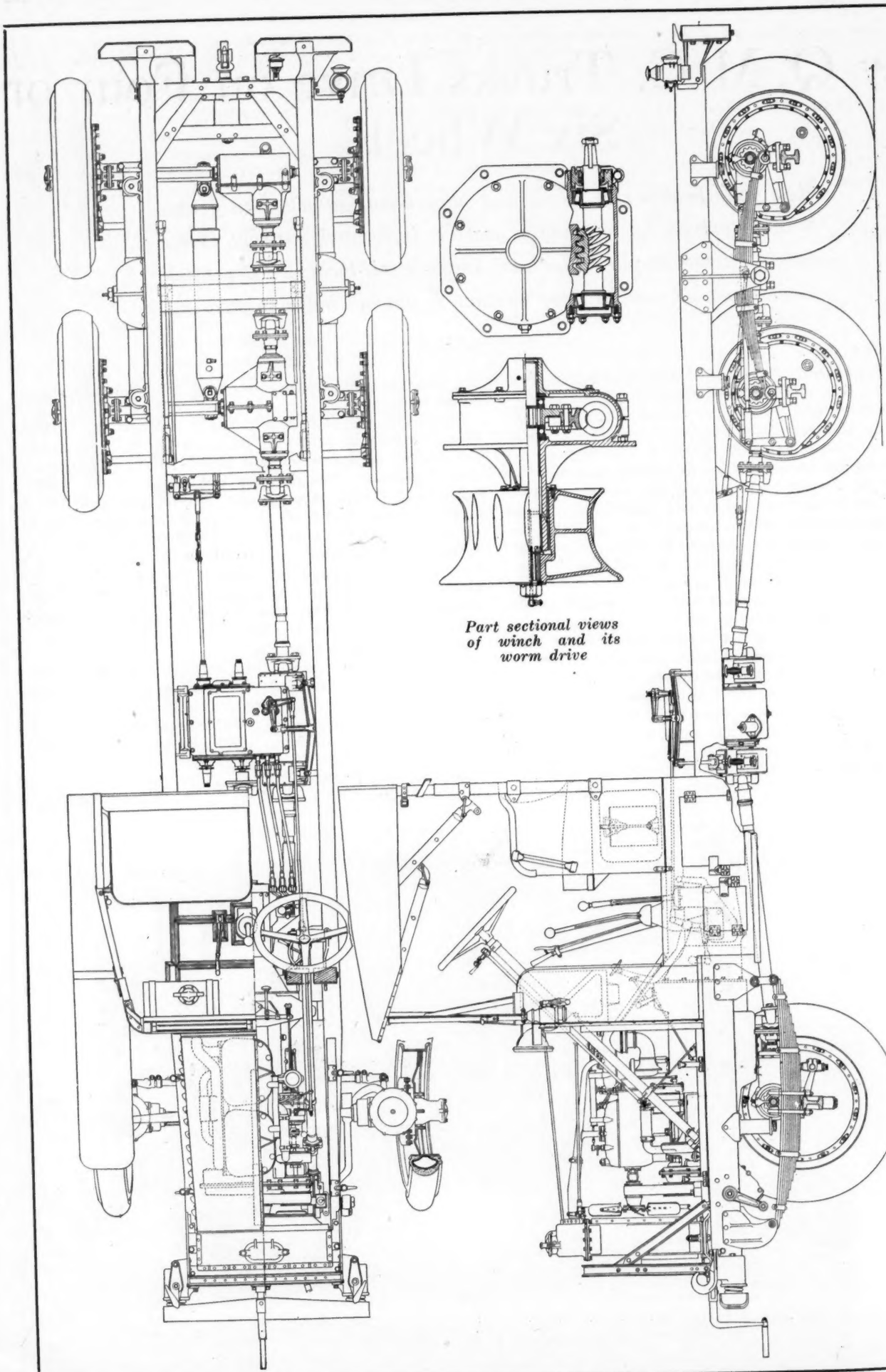
The engine employed is a Hinkley Model H. A. 1600 four-cylinder type of 4½ in. bore and 5½ in. stroke which is mounted as a unit with a Model RUP-4-C four-speed Covert gearset. The drive is through a 8⅞ in. Covert clutch and thence through the gearset and two Peters universal joints and shaft to a special drop gearset. From the rear end of the latter there is a drive shaft with two Peters universal joints connecting to the rear axle and a second shaft arranged for driving the winch. The full power of the engine can be transmitted to the winch either through the direct drive from the main gearset or through the reduction gears in the latter, so that a wide range of speed and torque is available.

Drive to the front axle is also through a shaft with two Peters universals one of which is carried at the front end of the drop gearset. Both of the main drive shafts are offset from the centerline of the chassis to clear the crankcase of the engine in front and to make more room for the winch and its drive at the rear.

Among other unusual features is the use of a universal joint in the steering gear shaft—a construction designed

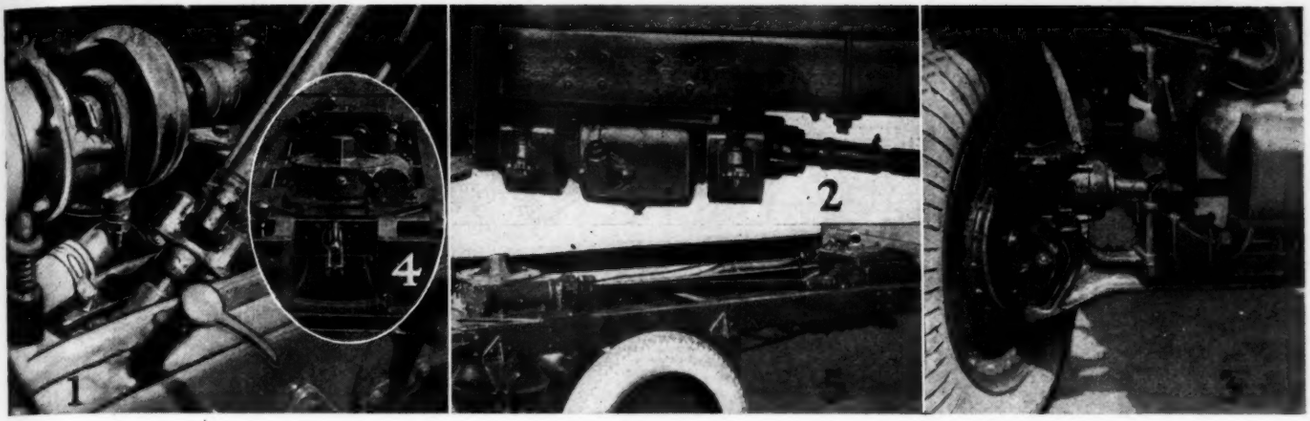


Left side of the new four-wheel drive two-ton truck which created considerable interest among engineers at the recent S. A. E. meeting



Part sectional views of winch and its worm drive

Plan and side elevation of new Q. M. C. six-wheel drive truck designed for operation on poor roads or over open country



Detail views of units used in the four-wheel drive Q. M. C. truck: 1—Universal joint in steering gear column. 2—Lower portion of secondary gearset showing convenient and accessible hand adjusting wheels for service brakes. 3—Bevel gear housing covering front wheel drive. 4 and 5—Winch and its driving mechanism

to insure free steering and facilitate assembly and ready detachment of the steering gear and its column—and a starting motor the functioning of which is dependent upon an electric contact device controlled by a Sylphon which closes the starting motor circuit only when the engine jacket water is warm. This device is calculated to prevent abuse of the starter and battery by prolonged cranking when the engine is cold. It permits quick cranking when the engine is stalled when warm and also enables cranking under similar conditions if the nose of the vehicle happens to be in a bank or so close to a wall or other obstruction as to prevent use of the hand crank.

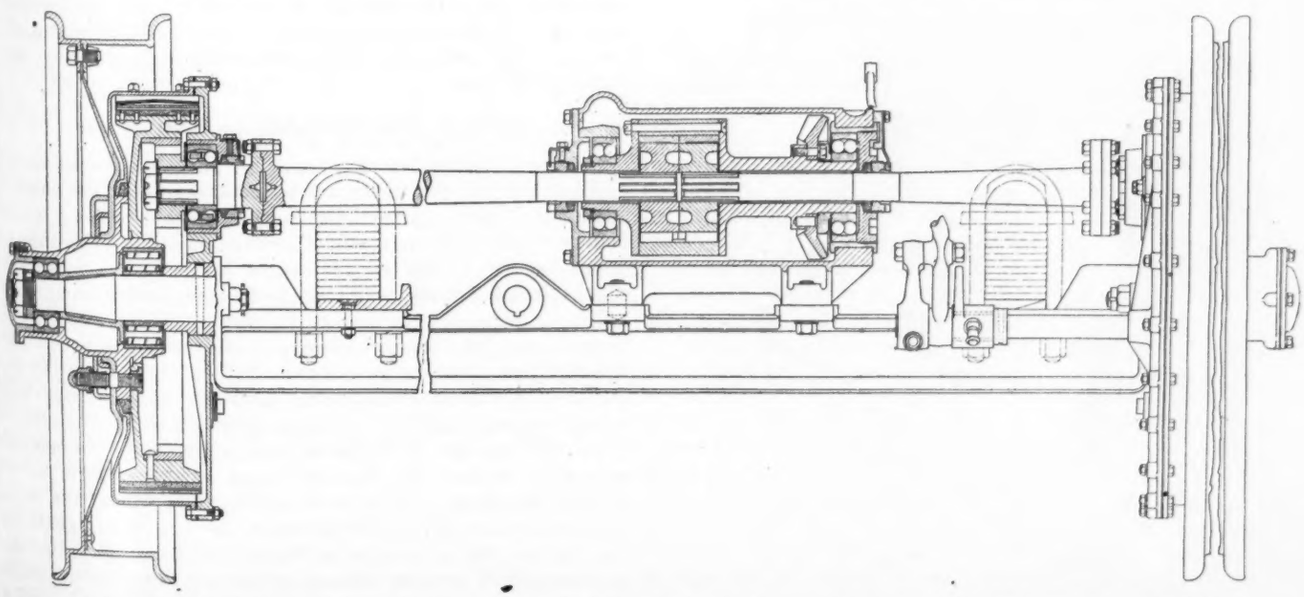
Foot brakes operate on two drums of 9 in. diameter placed at the ends of the propeller shafts each side of the drop gearset. The bands are 4½ in. wide and are contracted by toggle mechanism. They are said to be capable of controlling the truck easily when it is fully loaded and have the advantage of ready accessibility both for adjustment, which is made by hand wheels at the toggle joints easily reached at the side of the truck, and for relining of bands. The latter are much more accessible than wheel bands would be.

Band brakes are used on the rear wheels also, but are fully inclosed and arranged to run in oil. This is just the reverse of ordinary construction employed in internal gear drive axles in which much care is used to prevent the oil from the gearing reaching the brake bands. In this case the same oil answers for both and, while the coefficient of friction against the lining undoubtedly is decreased materially and the capacity of the brakes correspondingly lessened, it is said to be possible to employ the brakes in continuous application on long grades without the serious overheating and consequent rapid wear which occurs under similar circumstances with the conventional form of brake.

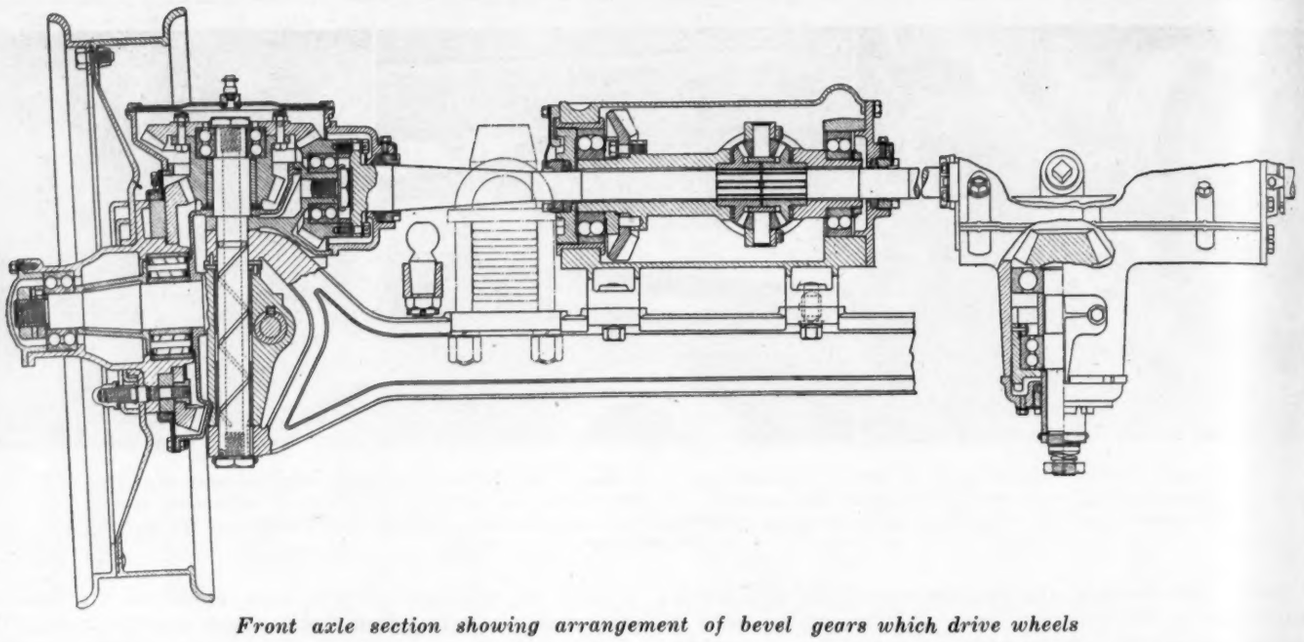
Brake Lining Riveted to Drum

Another departure from usual practice in this brake design is the mounting of the lining on the heavy brake drum to which the internal gear ring is attached instead of riveting it to the brake band. With this form of construction it is possible to use a band formed to a true circle, which will not drag at any point, and to avoid having the band bent when new linings are applied, as it often is with the usual construction. In this case a full wrapping type of brake, with the anchorage at one end, is employed.

Full inclosure has the obvious advantage of keeping



Sectional view of internal gear drive rear axle. Note inclosed full wrapping brakes which run in oil and have linings attached to drum

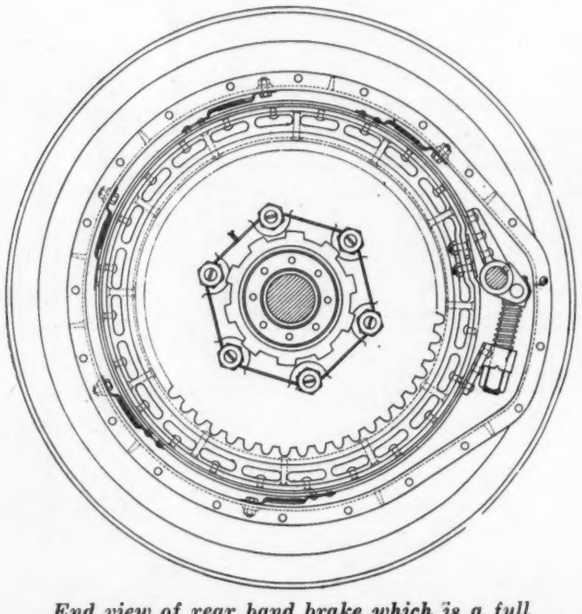


Front axle section showing arrangement of bevel gears which drive wheels

dirt and water off the brake surfaces—a very important point in the case of a truck which is intended for operation where hard roads may be lacking entirely or over open country which is entirely roadless. This class of trucks must also stand in the open during cold weather, a condition under which brakes covered with wet mud often will freeze solid. Details of the brake construction, best appreciated by reference to accompanying drawings, also are worthy of study.

The live axle, differential and ring gear are mounted in a housing on top of the I-beam center and are made readily removable. Live axle shafts are splined at the differential end and flanged near the outer end. Removal of the flange bolts permits the live axles to be disconnected from the pinion shafts and thus frees the whole center unit, which then can be removed easily for servicing operations performed at the bench. The flanged stub shafts which carry the pinions meshing with the internal gear rings in the wheels are mounted in double-row ball bearings.

Wheels turn on similar bearings at the outer ends of the hub and have Hyatt bearings with large diameter rolls at the inner ends of the hub. One single-row and one double-row ball bearing is used on each bevel pinion shaft, while double-row ball bearings are placed each side of the differential. The latter is the Andrade self-locking type in the rear axles, but the conventional bevel pinion type is used in the central units for front axles to avoid interference in steering.



End view of rear band brake which is a full wrapping type

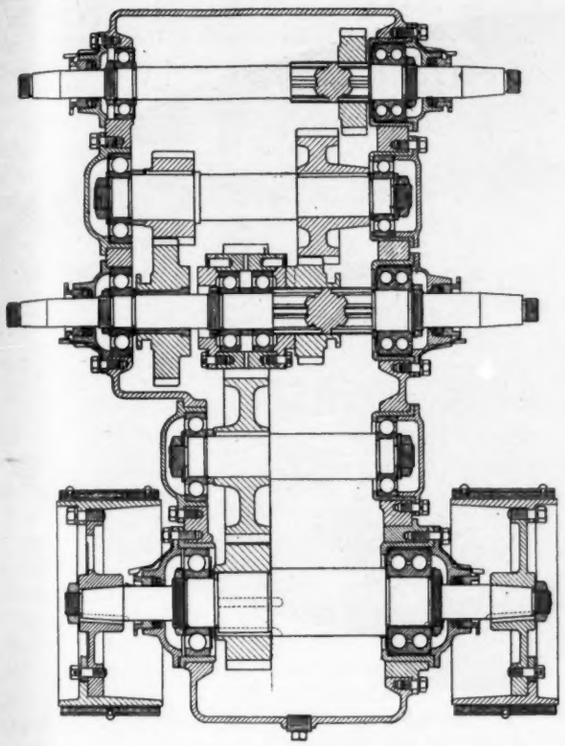
A number of the front axle parts are interchangeable with those of the rear axle. Originally a differential was placed between the propeller shafts driving front and rear axles, respectively, but this has been found unnecessary and is replaced by a solid shaft.

In the six-wheel drive jobs, both rear axles are substantially identical. They are joined by a drive shaft with two universal joints, by a pair of semi-elliptic springs and by a telescoping torque member of the type employed in the U. S. A. Class C truck shown at Spring Lake in 1923. This torque member is pivoted about vertical axes at each end and permits the axles to move apart as the springs are flexed as well as to assume different relative angular positions when the wheels on one side pass successively over uneven places in the road. The tubular torque member is filled with oil which lubricates the turning and sliding surfaces.

Springs Not Shackled to Rear Axles

Springs joining the rear axles are not shackled at either end but are pivoted to the axles and attached to the chassis frame by trunnions at their centers. Each brake lever of the two pairs of rear wheel brakes on the same side is connected by a link which causes both brakes to be applied simultaneously. Aside from the double rear axle and changes incident thereto the four and six-wheel truck chassis are the same in general design, although the six-wheeler has a longer wheelbase (160 in. instead of 150 in. on the four-wheeler), a correspondingly longer frame and a load capacity 2000 lb. greater than the four-wheeler.

As will be seen from the accompanying cut, the drop or secondary gearset has five shafts, all of which are mounted in ball bearings. The central one is driven from the main gearset, either direct or through the reduction gears of the latter, by a double universal joint shaft. On the primary shaft are two sliding gears, one keyed to the shaft and the other free to turn upon it. In the center is a pinion with a clutch at each side. When either sliding



Sectional view of secondary gearset. Upper shaft drives winch and shaft at bottom is connected to propeller shafts driving front and rear axles. Note arrangement of service brakes

gear is engaged by use of its respective clutch the drive is transmitted through a gear on an idler shaft and thence to the shaft, which is connected at the front to the propeller shaft driving the front axle and at the rear to the propeller shaft driving the rear axle.

One of the two gears gives a considerably greater reduction than the other, so that, in combination with the four speeds of the main gearset, a total of eight forward and two reverse speed changes is available.

At the other side of the gearset is an idler shaft and the shaft for driving the winch. The latter has a sliding splined gear which can be meshed with one of the idler shaft gears when it is desired to operate the winch. The arrangement is such that the maximum reduction of the main gearset plus the reduction of the winch driving gears can be had to give a very high torque on the winch or, if desired, a comparatively high speed with moderate torque.

Any of the four speeds of the main gearset can be employed to operate the winch, either with the truck stationary or in motion. The winch can be employed to pull the truck out of a hole, if a suitable anchorage can be found for a rope or cable, or it can be used to aid in loading or unloading.

Details of the winch, which is not shown on the assembly view of the chassis, are given in a separate drawing. When in place on the chassis frame it is entirely below the body floor, while the capstan projects well below the frame and has its center only a little above the rear axle level, so that the moment arm, tending to overturn the truck when a heavy pull is applied, is as short as possible.

Reference to the drawing of the front axle shows a design which is similar in some respects to certain French and German designs in which some of the bevel driving gears are concentric with the knuckle pivot. The present design differs from these earlier designs, however, in having both the gears in the knuckle axis above the axle center where they are well above the road surface. Furthermore, it is not necessary to use a live spindle in the knuckle pivot.

In the design under consideration the live axle shafts are much the same as those used in the rear axle. They are splined into the bevel differential carrier at their inner ends and are flanged at their outer ends for bolting to the bevel driving pinions. The latter are mounted upon a double-row ball bearing and mesh with bevel ring gears which are at the top of and concentric with the knuckle pivot.

Attached to these gears are flanged sleeves with integral bevel pinions at their base. These pairs of gears are carried on double-row ball bearings and Hyatt roller bearings, which are mounted on the upper ends of the fixed knuckle pivots. The pinions in turn mesh with bevel ring gears which are attached to the wheel hub. The mounting of this hub is identical with that of the rear wheel hub.

All gears are fully enclosed and are so disposed as not to decrease clearance under the axle. A full 15½ in. clearance has been maintained under both front and rear axles.

Knuckle pivots are vertical as viewed in front elevation, but the center line of the wheel spindle makes an angle of 2 deg. with the horizontal, so that the wheels are slightly undergathered. The drag link is somewhat shorter than usual and extends from the axle forward to the steering arm which is outside the frame with its lower end near the front spring eye. This is a favorable layout from the standpoint of preventing wheel wobble under the influence of spring action.

Although the steering gear is located between the frame and the engine it can be removed readily without disturbing the engine. This operation is facilitated by the use of a universal joint in the steering gear shaft. This joint also tends to prevent binding which often occurs when the steering gear and column are rigidly joined, owing to weaving of truck frame causing misalignment between the housing of the gear and the bracket which attaches the column to the dash. The steering gear used is a standard Gemmer worm and wheel type, but the universal connection is special.

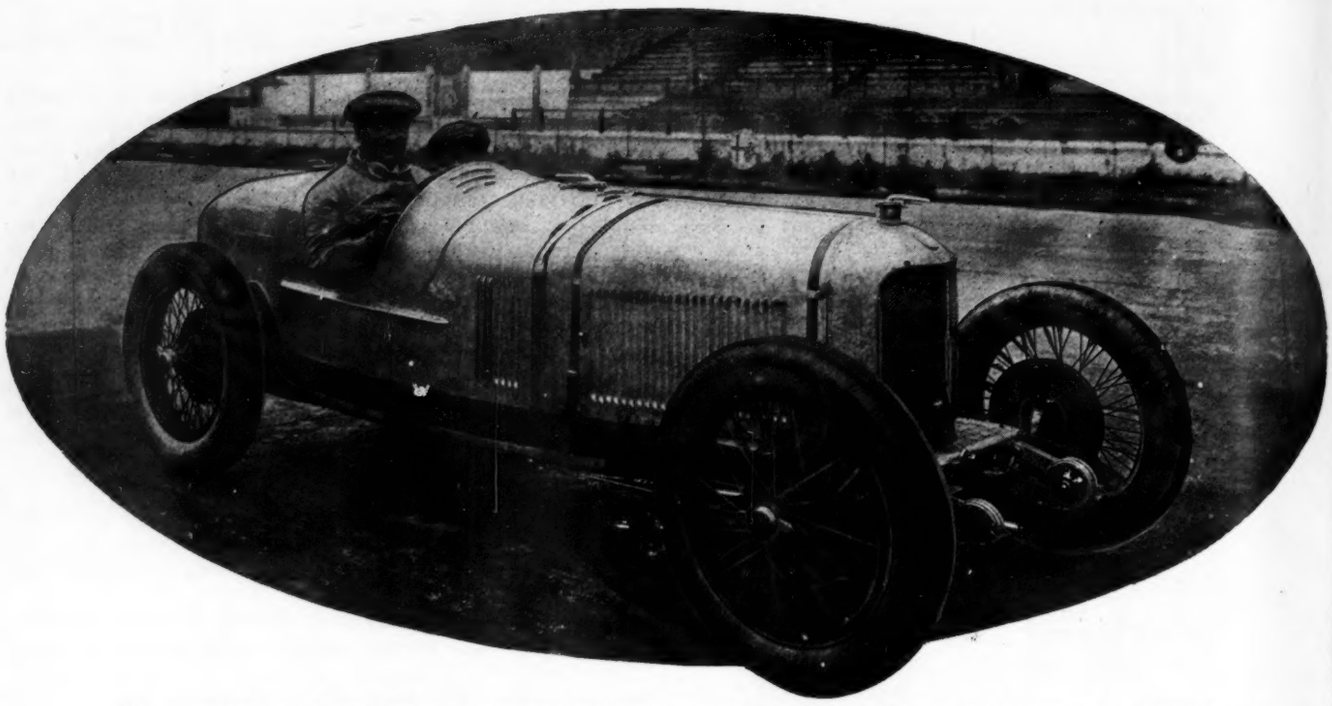
On the four-wheel model front and rear springs are interchangeable. Disteel wheels fitted with single 38 x 7 in. giant pneumatic tires are used, front and rear.

Separate Control for Drop Gearset

The ordinary controls are mounted on the gearset in conventional manner, but a separate lever, just to the right of the driver's legs is provided to control the drop gearset and winch. The radiator and its guard are fastened together to form a separate assembly which can be removed as a unit after simply disconnecting the hose and removing two hold down bolts. The latter are provided with helical springs under the nuts and the radiator rests on pads of rubber and fabric composition which act as cushions. The mounting is such as to protect the radiator from stresses which may result from frame distortion.

Dash, windshield, top and seat are separate units all of which can be removed easily if desired; but none of them require removal to permit of ready access to parts which they cover. Tool boxes are built as a part of the running board assembly, somewhat after the pattern employed in Mack trucks.

The storage battery and the main fuel tank are located under the seat, but fuel is not fed direct to the carbureter from the main tank. A Stewart vacuum tank is employed to raise the fuel from this tank to an auxiliary tank in the dash, whence it can feed by gravity to the carbureter when the proper cocks are opened.



Guiseppe Campari at the wheel of his straight eight, supercharged Alfa-Romeo which won the Grand Prix Race, averaging 71 miles an hour

Straight Eight, Supercharged Car Wins Grand Prix, 503 Mile Race

Alfa-Romeo takes first place in European classic in which engines are limited to 122 cu. in. displacement. Speed lower than previous record. Eight of twenty starters finish.

By W. F. Bradley

GUISEPPE CAMPARI, in his Alfa-Romeo, won the European Grand Prix, 503-mile race for 122-in. cars on Aug. 3 in 7 hr. 5 min. and 34 sec., averaging 71 mi. an hour, before the biggest crowd ever gathered in France for such an event.

Seagrave, in his six-cylinder, supercharged Sunbeam, took the lead and held the pace for the first three laps of the race, then lost to Bordino in a straight eight, supercharged Fiat. Bordino kept the lead for ten laps until his brakes gave way when Ascari in a second Alfa-Romeo forged ahead.

Lap after lap he fought to hold his position until, 14 mi. from the end, hard pressed by Campari in his Alfa-Romeo and Divo in his Delage, which was not equipped with a supercharger, an engine seizure forced him to drop back.

Campari then took the lead followed closely by Divo. From then on the race lay between these two drivers. Divo in his Delage tried to force his way ahead without success. He finished second, in 7 hr. 6 min. and 40 sec., just 1 min. and 6 sec. longer than Campari.

Of the twenty-two entrants only twenty started. Ferrari, driver of an Alfa-Romeo, withdrew owing to sickness, and Foresti wrecked his Schmid before the race began.

All Fiat cars went out before the race was finished, Pastore running off the road and the others having minor engine trouble. Guinness broke the transmission on his Sunbeam and had other minor troubles. Tire trouble held all of the Bugatti drivers back except Vizcaya, who ran off the track. Aluminum alloy wheels which were one of the features of the Bugatti fleet, proved a success. The Miller dropped out at the half-way mark.

Of the twenty-two cars originally entered in the

How They Finished

Car	Driver	Time
Alfa-Romeo	Campari	7 hrs. 5 min. 34 sec.
Delage	Divo	7 " 6 " 40 "
Delage	Benoist	7 " 17 " 00 "
Alfa-Romeo	Wagner	7 " 25 " 10 "
Sunbeam	Seagrave	7 " 28 " 56 "
Delage	Thomas	7 " 37 " 27 "
Bugatti	Chassagne	7 " 47 " 26 "
Bugatti	Friedrich	7 " 51 " 45 "

Grand Prix fourteen had straight eight engines, five had six cylinders and three had twelve cylinders. Supercharger devices were used on eleven machines, including the Fiats, Alfa-Romeos and Sunbeams. The Delage 12-cylinder engines were designed to be run with a supercharger, but this device was not employed in the race.

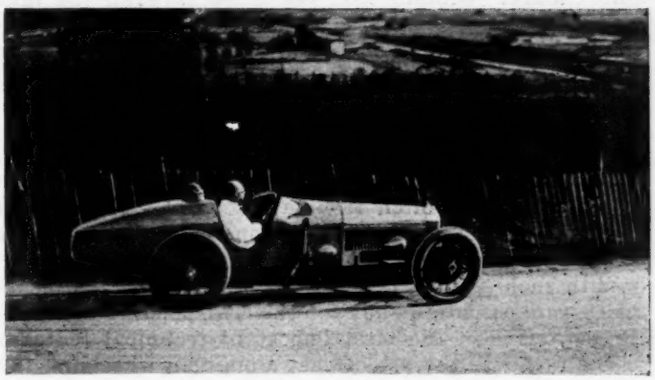
Experiments were carried out with a view to fitting the eight-cylinder Miller with a supercharger, but it eventually was decided to start it in the condition originally received from the factory, with a fourth gear added to meet the hilly road conditions. Bugatti declared himself against the use of a supercharger. The S. R. O. Ball Bearing Co. entered two Schmids with a cuff valve which was claimed to have advantages over poppet valves and needed no supercharger.

Fiat continued on the same general lines as last year with a supercharger placed after the carbureter. The most important change was the fitting of a cooling device between the front dumb irons through which all the air is passed before going to the blower.

The supercharger on the Alfa-Romeo cars was mounted on the front end of the crankshaft, drawing in air around the base of the radiator and delivering it through a cast aluminum conduit bolted to the right-hand side of the engine between the base chamber and the frame member. The Memini carbureter was bolted to the top of this air conduit, the base of which was ribbed for cooling purposes.

Sunbeam differed from these two in having the carbureter, a 50 mm. Solex, mounted ahead of the blower. The carbureter, which was placed near the front end of the engine, with its mouth turned rearward, was connected up to the ribbed blower, mounted on the front end of the crankshaft, and ran at engine speed. The mixture was delivered from here through a horizontal pipe to the normal intake manifold.

To overcome any possibility of damage by reason of a blow back into the compressor, there was a relief valve, opening outwards, immediately at the base of the intake manifold, thus allowing an exploded charge to pass outside the hood. Sunbeam stated that very excellent results had been obtained from the use of this device, the great advantage being an increase in power at all engine speeds from 2000 r.p.m. up. This was particularly important on such a course as that at Lyons, on which rapid acceleration was required at frequent intervals.



Divo descending a hill in his Delage twelve, not equipped with a supercharger, which came in second

There is no doubt that the supercharger enabled a considerable increase in maximum power to be obtained from this year's 122 cu. in. cars. Fiat claimed that the new engine showed 150 hp. The Sunbeams were said to give 145 hp. on the brake, and the Alfa-Romeo engineers stated that they obtained 140 hp. at 5500 r.p.m. It appeared doubtful if the others showed more than 120 hp.

As to the speed ability of the cars, 130 m.p.h. appeared to be the maximum over a measured kilometer on the road. This result is obtained with two-seater cars having two men aboard, fitted with front wheel brakes and all equipment for long distance road racing. Single seaters are not yet allowed in European speed competitions, and road conditions call for a rather heavier construction than track racing. Bugatti appeared to be the only one capable of coming well within the minimum weight limit of 1433 lb. Fiat was fairly close to this weight limit, but some of the cars scaled around 1600 lb.

Hotchkiss drive lost favor this year before central drive comprising a torque tube with ball head. Fiat, Alfa-Romeo and Sunbeam used this construction, the last mentioned having been redesigned to incorporate this feature. A considerable improvement in the road holding ability of the cars was obtained by reason of

European Grand Prix Entrants, 1924

Make	Drivers	No. of Cylinders	Bore and Stroke	Valves per Cylinders	Supercharger	Carbureter	Magneto	Clutch	Gears	Final Drive	Brakes	Wheels	Shock Absorbers	Tires	Wheelbase, Ins.	Track: Front, Rear, Ins.
Sunbeam	Seagrave Guinness Resta	6	64x94	2	Yes	Solex	Bosch	Disc	4	Bevel	4 wheel mechan. servo.	R.W.	Hartford	Rapson	98	43 39
Fiat Eldridge	Nazzaro Bordino Pastore Eldridge	8	60x87.5	2	Yes	Fiat	Bosch	Disc	4	Bevel	4 wheel mechan. servo.	R.W.	Hartford	Pirelli S.S.	105	47 47
Alfa-Romeo	Ascari Wagner Ferrari Campari	8	61x85	2	Yes	Memini	Bosch	Disc	4	Bevel	4 wheel hydraul. servo.	R.W.	Hartford	Pirelli S.S.	102	53 49
Bugatti	Friedrich Vizcaya Constantini Chassagne Garnier	8	60x88	3	No	Zenith	Bosch	Disc	4	Bevel	4 wheel	Alum.	Own	Dunlop S.S.	.....	.....
Delage	Thomas Divo Benoist	12	51.3x80	2	No	Zenith	Bosch	Disc	4	Bevel	4 wheel mechan. servo.	R.W.	Hartford	.....	102	51 47
Schmid	Goux Forestì	6	64.8x100	Cuff	No	Zenith	Bosch	Cone	4	Bevel	4 wheel	R.W.	Hartford	.....	98	43 39
Miller	Zborowski	8	.....	2	No	.....	Delco	Disc	4	Bevel	4 wheel	R.W.	Hartford	Rapson	.....	.....

this change. Schmid took the drive through the tube and used the semi-elliptic springs for the torque reaction, which is a method not at all in accordance with European practice.

Plate and Disk Clutches on Most Cars

Plate and disk clutches were used by most competitors, among those having made a change being Sunbeam, who was a victim of clutch trouble last year. The Schmid cars were the only ones with a cone clutch, and in this case the fabric lining was on the flywheel member.

With such a course as that at Lyons four-speed gearboxes were essential, and even the Miller had to be transformed. One of the most important technical features of the race was the use of cast aluminum wheels on the Bugattis. It is claimed that these wheels, with eight double rows of flat spokes, and the brake drum cast integral with the wheels, weigh 4 lb. less than a wire wheel of equal size. Bugatti maintained that they offered less resistance and that they materially assisted in cooling the tire.

Freak bodies were not being used this year, there being a distinct uniformity in the external lines of the competing cars. The plan of mounting the gasoline tank on a cradle with a couple of steel bands to hold it down, and leaving a cover of sufficient size for it to be lifted out, in case of necessity, was followed by all the competitors. With this design a gasoline tank can be lifted out in 3 min. and a new one fitted in 10 to 15 min.

A lot of attention was paid to detail refinement of streamlining, and as part of this program practically all cars had the brake and change speed levers in the center, even when the steering was on the right. A lot of work had been done to reduce height, and some of the racing cars were not more than 39 in. from the ground at the highest point. The under-surface was given close attention by putting the rear axle, springs and shock absorbers inside.

Big Section Tires Used

Unusually big section tires were employed in the race, and during the practice period the Alfa-Romeos used 5-in. section on the rear and the Fiats had 5-in. tires both front and rear and had 6-in. straight side tires on which tests were going to be carried out. These balloon tires were inflated to the normal pressure of 56 lb. On some of the cars straight side tires were run at the reduced pressure of 40 lb. at the rear and 35 lb. on the front wheels.

Alfa-Romeo, the winner in this year's race, was made by a Milan firm taking part for the first time in a really international road race. It adopted a straight engine of 61 by 85 mm. bore and stroke, with steel cylinders in pairs, and having two valves per cylinder driven by a couple of overhead camshafts. Although a supercharger was used, no details were given out regarding it other than that it was of a two-stage rotary type, and could be put into operation or thrown out of gear as desired. The Italian Memini carbureter was used. Engine speed was 5000 to 5500 r.p.m., and it was claimed that the output was 130 to 140 hp. Engine clutch and gearbox were a unit, the cars were fitted with four-wheel brakes, and Pirelli straight side tires were used. The track was 53 in. in front and 49 in. at the rear, with a wheelbase of 102 in.

The three Italians, Ascari, Campari, the winner, and Ferrari, and the French veteran, Louis Wagner, were selected as the drivers of the Alfa-Romeo racers.

The Delage racers, which came in second and third, had twelve cylinder engines of 51.3 by 80 mm. (practically 2 by 3.1 in.), giving a total piston displacement just inside the 122 cu. in. limit. Connecting rod heads are mounted side by side on the six-throw circular web crankshaft.

To reduce weight and to make possible inspection of the cylinder barrels, the cast iron water jacket was replaced by a screwed-on copper jacket. There were two valves per cylinder, inclined in the head and operated by separate camshafts for intake and exhaust, the driving gear being at the front and consisting of spur pinions. The case-hardened crankshaft was carried in seven roller bearings, with the rollers in direct contact with the shaft. Rollers were also used for the main bearing of the I-section connecting rods, and the aluminum pistons had hollow floating wrist pins. The compression ratio was 7. Three concentric springs were used for each valve, and there was a light follower between cam and valve stem.

Two Magnetos Used

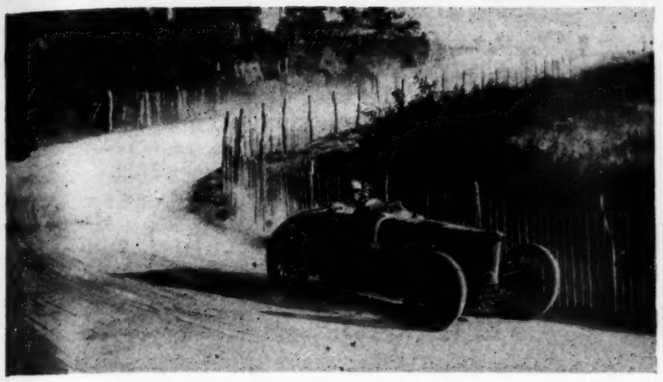
Two Bosch magnetos, which ran at three-quarter engine speed, were mounted on cradles and driven from the front end of the engine, each magneto firing six plugs placed in the center of the hemispheric combustion chamber. Below the magnetos, and driven off one of the intermediate gears, was a double centrifugal water pump giving a direct supply of water to each group of six cylinders. The engines had been designed to run with superchargers, and two separate blowers were provided, carried in an aluminum housing at the front end, with a separate air pipe to each of the two carbureters. These were mounted on the outside of the engine.

Most European makers have adopted this plan of placing the blower before the carbureter. The exhausts were on the inside of each cylinder block, the twelve pipes being brought up vertically into a central collector, from which there is a lead passing through the left-hand side of the hood and extending to the tail of the car.

Dry sump lubrication was used, with three pumps, one scavenging the base chamber, another delivering oil to the main bearings and to the constant level troughs, and the third giving a direct feed to the overhead valve gear. The main oil tank was the full width of the chassis, back of the gearbox, and was fitted with open end longitudinal tubes for cooling purposes. There was an oil tank on the scuttle with a lead to the air-cooled chassis tank, the supply of oil being replenished through the scuttle tank.

Engine, clutch and gearbox formed a unit, with attachment to the main frame members by means of two cross girders. The clutch was a disk type with Ferodo lining for the plates. To keep down head resistance the change speed lever was on the top of the gearbox, thus calling for left-hand gear changes, for the steering wheel is on the right. An open propeller shaft with a couple of ball bearing universal joints transmitted the drive to the bevel rear axle, which was provided with a differential.

These cars being designed more for road than for track racing, a four-speed gearset was fitted with four-wheel brakes as a part of their equipment. The front axle was a three-piece tubular construction, the center part comprising the spring seats and the two end sections with the steering pivots being flanged and bolted to the center. A band type servo, with its drum mounted on the left-hand extremity of a cross shaft driven from the gearbox was made use of to apply the four brakes simultaneously. There was a separate control for the rear wheel brakes. Cables were used for all brake connections.



Seagrave, who won last year's Grand Prix, shown rounding a curve in his Sunbeam which came in fifth in this year's race

Tire trouble held back the entire Bugatti fleet, but the aluminum alloy wheels proved a success. The fleet was housed under canvas

Two-seater bodies are obligatory under European rules, but the seats were staggered in relation to one another as much as possible. The gasoline tank is inside the tail, the filler cap being inclosed, but easily accessible through a hinged flap, while provision was made for a quick change of tank, if necessary, by mounting it on a cradle, to which it was held by a couple of steel bands, and by leaving a hinged door on the tail big enough to allow the tank to be lifted out. All the underworks were inclosed, the rear axle inside, but no attempt was made to encase the springs or the front axle.

At the front the track was 51 in., this being reduced to 47 in. at the rear, while the wheelbase was 102 in. In complete running order, but with tanks empty, the car weighed about 1500 lb. Clincher bead tires of 765 by 105 were used on Rudge Whitworth wire wheels, the tires being held in place by six of the new duraluminum safety lugs brought out by Michelin. European drivers considered that this gave as great a degree of security as straight side tires, with less weight at the circumference.

Bugatti Straight Eight

With five cars entered for the European Grand Prix, Ettore Bugatti built ten in his factory at Molsheim, five of which were thoroughly tested on the bench and the road, and the five others were started with just the necessary preliminary running in to make them free. The beetle back type of body, which was a feature of last year's Bugattis, was abandoned; not because it was found inefficient—Bugatti claims that it saved power—but because the new cars are to be sold and freak lines are objected to by clients.

One of the outstanding features of these cars was the use of cast aluminum alloy wheels, each one having eight flat spokes and forming a single casting with the brake drums. With these wheels the tire, whether straight side or clincher bead, is rigidly locked to the rim and cannot possibly creep. Before it was decided to adopt these wheels for the Grand Prix road race, very searching tests were made, the cars being run at speed without tires and being made to skid violently on a greasy road to prove their ability to withstand lateral shocks.

A hand-forged tubular front axle, weighing only 28 lb., was made use of this year. The center portion of the axle, between the spring pads, is hollow, while the two extremities are solid, this being obtained by boring out the forging, then closing up the two ends and machining externally to the desired section.

A straight eight three-valve engine of 60 by 88 mm. bore and stroke was used, of the same general type as the one employed last year, and similar, with the exception of the valve diameter and valve lift, to those delivered to clients. The crankshaft is a built-up type carried in roller bearings. The weight of the one-piece connecting rods has been reduced by one-half and by reason of this and the more accurate balancing of the crankshaft, engine speed was considerably increased.

The Bugattis were the lowest of the 22 cars entered in the European Grand Prix race and probably will be among the lightest, for they are so far under the minimum of 1433 lb. that an electric starter could be added before delivery to clients. The chassis members followed the outline of the body.

Cuff Valve Schmids

A cuff valve, for which French and foreign patents are held by Engineer Schmid, chairman of the S. R. O. Ball Bearing Company, was the distinctive feature of the two six-cylinder Schmid cars, but Foresti, one of the drivers, wrecked his machine before the race. The engines were six-cylinder models of 64.8 by 100 mm., with the cylinders in one casting mounted on an aluminum base chamber which formed a unit with the clutch and gearbox.

An eight-piece crankshaft, assembled by cone and key, was carried on four bearings, the two outer ones being S. R. O. radial ball type and the two inner ones a special type of roller bearing. A detachable head was used, but this carried only the spark plugs and the guide for the inverted T shaft by means of which the cuff valve was operated. The cuff valve, which weighs only 4.2 oz., is in the cylinder barrel, and has a reciprocating motion, the exhaust ports being covered when it is in its upper position and the intake ports when it is at the lower end of its stroke. During compression and explosion the cuff valve is motionless, covering all ports.

With a six-cylinder racing engine just within the 122 cu. in. limit, an area of 3.1 sq. in. was obtained for both inlet and exhaust ports, and as opening and closing were extremely rapid, it was claimed that there is complete filling and scavenging of the cylinders and really no necessity for a supercharging device. For racing purposes only, there are two inlet and two exhaust ports on opposite sides of the cylinder; thus there were two individual carbureters, on opposite sides of the engine, and an exhaust pipe on both the left and the right of the car.

The cuff was operated by an inverted T-piece, of B. N. D. steel, the stem of which is of circular section; the horizontal branches of the inverted T being received in a groove on the inner face of the cuff.

British Car Makers Fight to Hold Home Markets

Americans get price advantage through duty removal, but vehicles suited to special English conditions have excellent chance. Battle for business will be keen.

By Harry Tipper

LONDON, England, July 28—England of today presents some marked differences from the England of before the war. Singly none of them seem of importance, but together they show the way in which the British are tackling their job of paying an enormous debt and adding to the trade of their country.

There is more alertness and snap in business; there is less misery despite the unemployment; the good work of rebuilding is beginning to show. Above all there is a sober desire to carry through all the jobs, big as they are, and bring the country successfully along.

The Englishman believes that the European nations do not intend to pay back their debts to England. He is quite of the belief that they will pay the United States first and cannot then pay his debts. He believes that Europe apart from Britain is still war ridden and he believes that he cannot escape the responsibility for European peace.

That is why it is difficult to get his reaction on the McKenna duties and their removal. The McKenna duties were war duties. They were imposed to permit the British motor trade to adjust itself after complete immersion in war affairs. They were not repealed afterwards—no one appears to know exactly why. They remained in force through a government, Coalition in name, but largely Liberal in sentiment, were retained by a Conservative government and finally repealed by a Labor government, which might have been suspected of protectionist leanings.

When these duties persisted the British motor industry re-financed itself in 1919-20 and began the active reconstruction of the home and Colonial markets lost during the complete immersion in the struggle.

There is no unanimity as to the final effect of the repeal or whether it is permanent. The repeal is effective for a year—beyond that no one can say. The present Government's tenure of office is very uncertain, the temper of the people is not yet thoroughly tested on reasonable protection and the question is still open.

The removal of the duties, with so short a time for readjustment, has definitely affected the automobile trade already and it is possible to predict further factors which must be taken into consideration in estimating the practical results likely to follow.

The duties added 33 1/3 per cent to the actual cost of importations. When the action for repeal became known the motoring public naturally expected a substantial cut in car prices and the natural effect was an immediate stagnation of the regular buying during the best buying season of the year.

The second important effect was the encouragement to European motor manufacturers to make a bid for the British market. The exchange situation favors the French, Italian and Belgian manufacturers and it will also aid the Germans if the present conferences enable Germany to enter into the world markets seriously again. Citroen, who has an advantage in price already in the British market due to the position of the franc and lower wages, is actively campaigning for a larger share in the output absorbed by England.

European makers are much better acquainted with the British market than are the manufacturers in the United States. They are therefore in a position to take immediate advantage of the removal of the duty.

No change has been made in the horse power tax which is the governing tax in the buying of motor cars in Great Britain.

The development of small displacement, economical engines has been carried far, the chassis and body have been lightened and the small machines are made today with an astonishing degree of comfort for the passengers as well as speed area.

Such cars cost much less to run than the American-made vehicles and they are taxed on a very much reduced scale.

Britishers are more heavily taxed than any other people. A man making $5,000 a year is required to give to the Government more than $1,200 in taxes. Consequently the cost of running a car is of great importance and the heavy horsepower tax is also of moment.

For these reasons the Continental cars made to suit the same general conditions are immediate and real po-

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HARRY TIPPER is in England visiting some of the important automobile factories, talking with executives in the British automotive industry and analyzing the merchandising and production situation in this important market.

In this first article he tells how the removal of the McKenna duties is affecting the British trade and points out that price advantage alone will not be enough to increase American sales to their greatest possible maximum. He gives a close-up picture of the present situation in Great Britain as viewed by one who is thoroughly familiar with American problems.

In later articles he will point out some things about British production methods which will interest American executives very greatly, despite the general idea that our practice is so far ahead of England's that we have little to learn from it.

tential competition, particularly with the lower labor costs and the favorable exchange.

American cars are already favorable in price considering size, power and other similar standards; the question of lower price has its importance but it is quite subsidiary to the difficulty of putting the car within the means of the average motorist to run and making it suitable to his general habits in other ways.

It is quite apparent that the relatively small percentage of American cars visible in the British Isles is not due to the price of the cars, for the public is paying a bigger relative price in many cases for a smaller job. It is due to the fact that the American manufacturer has not considered it worth while to turn out a product which is reasonably suitable to the requirements and conditions of this particular market.

Considered from the American Standpoint

Many factors are involved in this consideration and other articles must deal with them more fully, but it is quite evident from a brief examination that the whole market is being considered from an American standpoint by the manufacturers in the United States. This refers not only to the British market itself, but also to the rapid rehabilitation of the British car in the Colonial markets of the world, particularly South Africa and India.

American cars are to be seen on the roads in England only in small numbers, in comparison with the domestic product. The small car favored by the British seems ridiculous in the eyes of the American manufacturer and scarcely worth figuring as competition; but an examination of the facts should remove any such conclusion and bring out the very definite economic psychologic and social reasons for this situation.

There is no doubt that the removal of the McKenna duties provides an opportunity for the American manufacturer, who has the courage to study the British market as such without attempting to make quick comparisons with the methods in use in the United States.

The lack of this intelligent consideration is the principal reason for the small number of American cars in use, relatively speaking, and the American manufacturer must be prepared to do some investigating if he wants to take advantage of the favorable situation in the question of duties and deal with the British and the new Continental competition.

Cars Must Meet Local Conditions

There should be no difficulty in meeting the prices required to do this as the American car in general is a cheaper product for any given type of unit, but the price advantage is dependent upon producing something suitable to the conditions.

There are important elements in this discussion of the markets which will constitute the subject matter of other articles. The point to be observed here is that the British and Continental manufacturers are alive to the situation, they know the market and they do not underestimate the strength of American companies.

Discussions with Americans indicate that we are apt to proceed too largely on the assumption that we already make the best car values and the other countries will see this after a while.

The best value is that which is most suitable to the market and the suitability is just as important as the price.

In considering the McKenna duties and the British market, it is important therefore to forget American practice for the time being and consider the matter from the independent point of view.

The British manufacturer is fully aware that the American car builder must enter more thoroughly into export for the stability of his business and he is taking steps accordingly, with his accustomed better knowledge of world conditions and affairs. The McKenna duties give the American manufacturer an additional price advantage, but they also give the same advantage to the Continental maker who is well informed on British requirements.

Friction and Cohesion Between Metals

THE impression prevails quite generally that the friction between two metal surfaces is the less the more finely the surfaces are polished, but according to a French scientist, M. Fichter, who has made some experiments along this line which he outlined in a note recently presented to the French Academy of Sciences, this view is incorrect. The author made measurements of the coefficient of (dry) friction between different materials such as iron on iron, brass on brass, steel on brass, copper on zinc. In every case he found that in starting with rather roughly finished surfaces the coefficient of friction at first decreased as the degree of polish was increased, but that it passed through a minimum for a degree of finish which he calls the critical finish, increasing very rapidly if the finish was still further improved.

If the surfaces are polished by means of the classical method of metallography, they cannot be made absolutely plane and there will always be an interposition of air between the surfaces. In order to keep the surfaces absolutely plane M. Fichter ground them together under water, the water containing alumina in suspension. This process is said to be very tedius and to require great skill. As soon as the desired finish has been obtained the surfaces are dried and placed in contact.

With brass on brass, for instance, it was found that the coefficient of friction decreased to 0.12 and then increased again very rapidly if the polish of the surfaces was improved, to such an extent that it required from 20 to 30 lb. per sq. in. to pull the surfaces apart.

It was thus possible with different metals to repeat the experiments which Johansson made with his gage blocks. By starting with samples previously ground as described above and subjecting them to heat and pressure, it was found possible to secure a real weld, so perfect that the welded body had to be subjected to a tension corresponding to its tensile strength in order to break the joint. The increase in temperature and the pressure required for obtaining such a joint were the lower the higher the degree of finish.

THE average full-time earnings per week for male workers in the automobile tire industry during 1923 was $36.75 and female was $22.54 according to a bulletin entitled "Wages and Hours of Labor in the Automobile Tire Industry, 1923" published by the U. S. Bureau of Labor. In giving the average weekly earnings the additional information is set forth that "the average full-time hours per week are 49.6 for males and 49 for females and that the full-time hours of 36 per cent of all employees are 48 per week."

The information contained in the bulletin covers 22,535 male wage earners and 1624 female wage earners working in 49 representative establishments located in Connecticut, Indiana, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin. It may be obtained from the Superintendent of Documents, Government Printing Office, for ten cents.

How and Why Ball Bearings are Used on Car and Truck Crankshafts

Some are guaranteed for life of vehicle. Keying of flywheel no longer a problem. Some saving in length of engine possible.

By P. M. Heldt

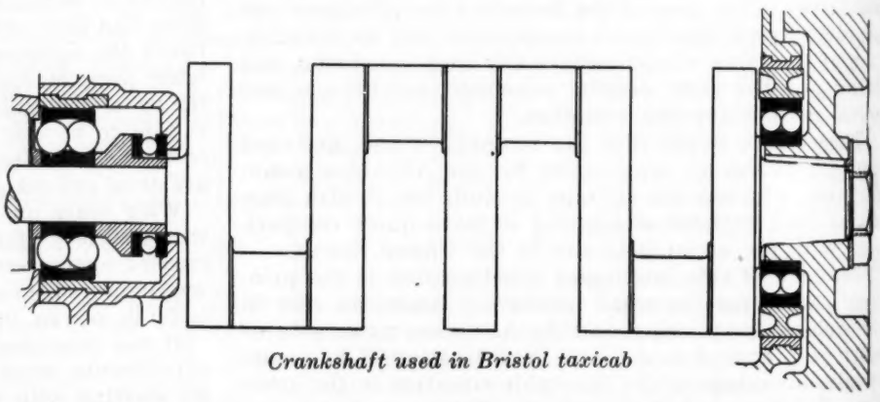
BALL and roller bearings are primarily friction-reducing devices, and their use generally results in the greatest advantage if the shafts on which they are mounted revolve at high speed, because in that case even a slight reduction in the frictional moment results in a considerable saving in power. It is therefore somewhat surprising that such bearings are no more extensively used in the engines of modern cars, in which even the low-speed shafts, such as the axle shafts, are invariably carried in anti-friction bearings.

That the ball bearing is entirely practical for this purpose is proved by the fact that it is being successfully used at the present time in quite a number of well-known vehicle engines, both in this country and abroad, and some truck manufacturers have used ball bearing engines continuously for ten years or more. As far as passenger cars are concerned, none are regularly manufactured in this country at the present time which embody this feature, which may be due to the fierce competition in this field—competition centering largely around prices. It is obvious that a ball bearing engine must be more expensive to manufacture than one with plain bearings, though in the case of a four-cylinder two-bearing engine the difference need not be important.

Among American truck manufacturers there are now three well-known concerns that use ball bearings on the crankshafts of either some or all of their engines, namely, the Autocar Co., the White Co. and the International Harvester Co. The latter company, by the way, also uses ball bearings on the crankshafts of its tractor engines.

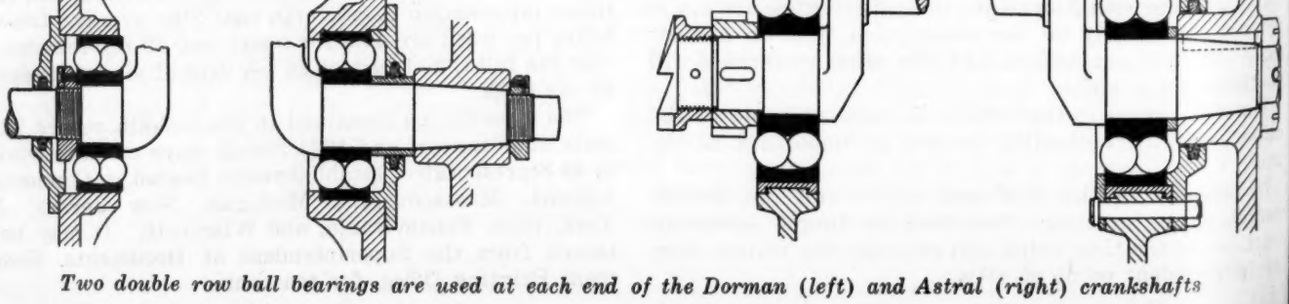
In the accompanying tables are given data regarding prominent makes of engine with ball bearing crankshafts used on both passenger cars and trucks. It is directly apparent from these tables that the ball bearing has its greatest appeal when only two main bearings are required, the crankshafts of seven of the nine truck engines and of six of the ten passenger car engines listed being of the two-bearing type. When only two bearings are needed, the extra cost of the ball bearings over the plain ones is a smaller item, but the main consideration undoubtedly is that in that case no difficulty is encountered in mounting the bearings on the shaft, if the usual practice of bolting the flywheel to an integral flange is departed from and keying is resorted to instead.

There are a number of advantages connected with the use of ball bearings on the crankshaft, some of which are rather obvious. In the first place, the frictional loss at the crank bearings is reduced. This advantage is evidently of greatest value in connection with racing engines and, as a matter of fact, the engines of racing cars are now generally fitted with anti-friction bearings.

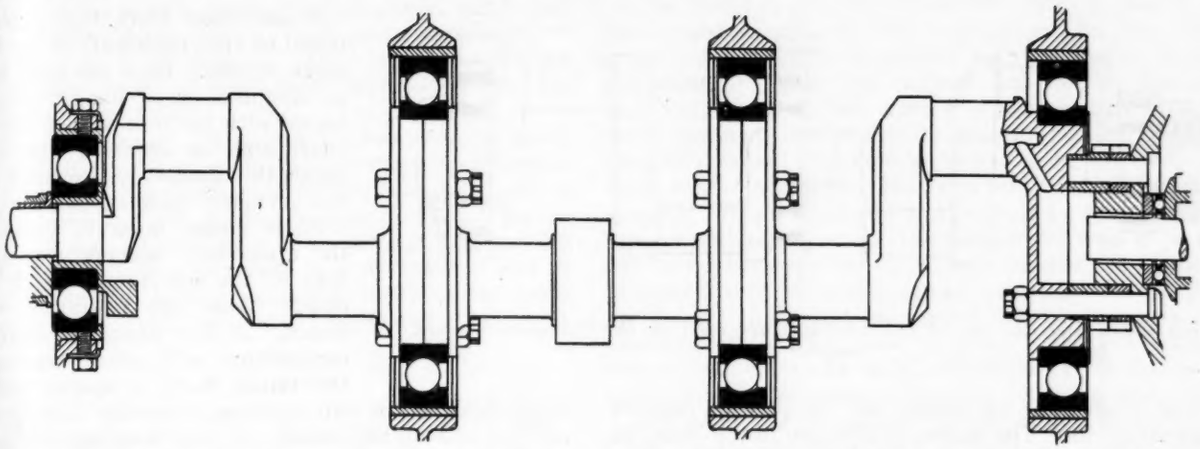


Crankshaft used in Bristol taxicab

Besides reducing the running friction, ball bearings decrease in an even greater degree the starting friction, and this is of considerable importance in crankshaft applications, in that it reduces the drain on the battery in starting, particularly in cold weather when the engine is first started in the morning after having stood all night in a



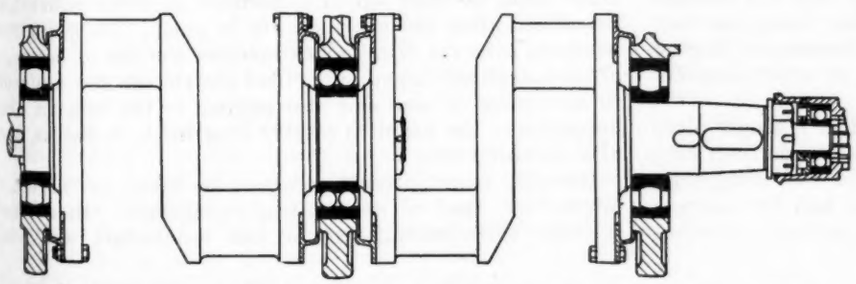
Two double row ball bearings are used at each end of the Dorman (left) and Astral (right) crankshafts



Crankshaft in Steyr six-cylinder engine has four ball bearings, three of which are of very large diameter

cold garage. In an engine with bearings on each side of each crank throw, the main bearings constitute about 20 per cent of the total bearing surface, including that of the pistons, and if this is eliminated it will make an appreciable difference in the starting torque.

In racing work the immunity of the anti-friction bearing from burn-outs and similar troubles is an important advantage, because it is a rather common thing for a car to be thrown out of a race by a burnt-out bearing. Of course, the connecting rod or crankpin bearings are subjected to equally severe service as the main bearings, and in order to fully eliminate the danger of burn-outs these two should be made of the anti-friction type.



The Simson, a small four, employs one ball and two barrel type roller bearings

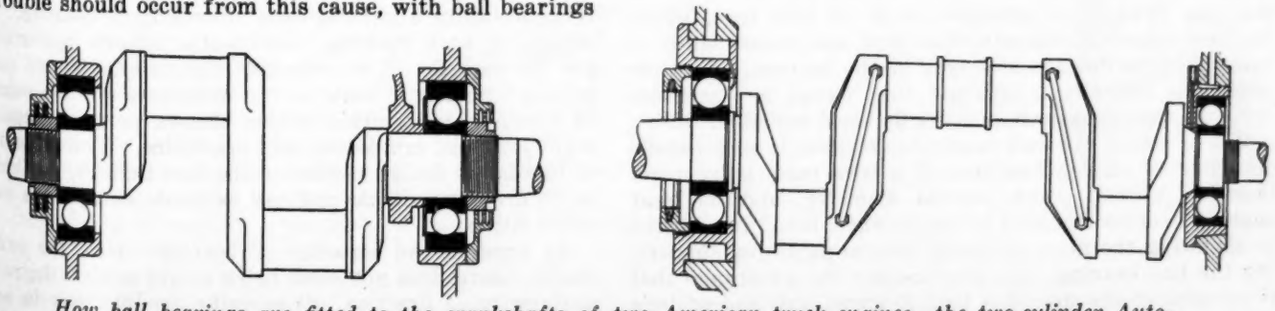
Aside from the gain in power, anti-friction bearings on the crankshaft possess the advantage that they do not require such effective lubrication as plain bearings and even can operate for long periods entirely without lubricant. The importance of this feature is greatly diminished by the fact that the engine cylinders and the several plain bearings, such as the piston pin and camshaft bearings, require a constant supply of lubricant and that if the supply fails for any reason these parts will give trouble. However, the main and connecting rod bearings ordinarily are the most sensitive to a lack of lubricant, and if trouble should occur from this cause, with ball bearings on the crankshaft there would be fewer points to be seriously damaged.

A further advantage of ball type main bearings resides in the fact that their use permits of reducing the overall length of the engine. If we take the case of a four-cylinder two-bearing crank, for instance, the two main bearings, if of the cylindrical type, are generally made of very considerable length and extend quite a distance beyond the ends of the cylinder block. The width of the proper size ball bearing is less than one-half the length of these plain bearings, and hence the overhang is practically if not entirely done away with. This permits of making the whole engine more compact and of saving on bonnet space.

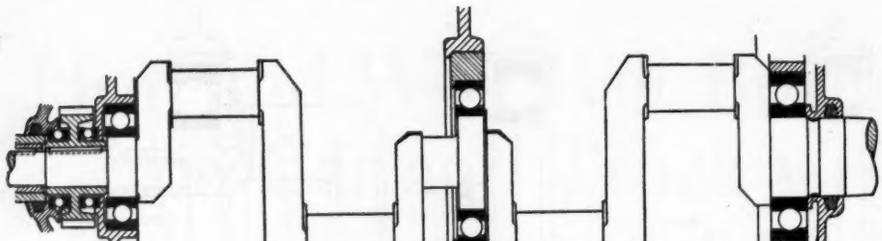
In connection with crankshafts which have several throws between supports, such as the four-cylinder two-bearing type, there is a special advantage in ball bearings in that they readily take up the slight flexure of the crankshaft under impulses without causing binding. In types of crankshaft with supports at both sides of each throw this is hardly a factor, however.

The ordinary crankshaft bearings are among the chief wearing points of an automobile, and adjusting these bearings is one of the most common repair jobs. A well proportioned and well made ball bearing may be expected to last the life of the car, and this item of maintenance cost therefore would disappear entirely. In fact, some of the manufacturers who fit their engines with ball bearings on the crankshaft guarantee these bearings for the life of the vehicle.

In this connection the claim is made that a ball bearing crankshaft is more rigidly supported when the engine is



How ball bearings are fitted to the crankshafts of two American truck engines—the two-cylinder Autocar and the four-cylinder White



Three radial and two thrust ball bearings are used on the Commercar truck engine

new, and practically maintains this rigidity of support throughout its life. The degree of freedom in the bearings when new is generally less than 0.001 in. and if the engine is not abused the wear of the bearings is almost imperceptible.

Ball bearings were first used in passenger car engines some twenty years ago, and if the writer is correctly informed it was the Daimler Motor Co., manufacturers of the Mercedes car, who made the first application of this kind. They were soon given up, however, and the reason assigned was that they were noisy. Quietness of operation in a ball bearing depends upon the accuracy of workmanship of the balls and races, upon the closeness of fit of the retainers and upon cleanliness, and it is hardly necessary to point out that in respect to the first two items at least a good deal of progress has been made during the past two decades. It is true that our modern engines run much faster than the earlier ones, but ball bearings of equal size to those used on automotive engine crankshafts are successfully operating in other applications at speeds of 10,000 r.p.m.

If a ball bearing crankshaft is forged in a single piece it is necessary to key the flywheel to it. It has been customary practically from the beginning of the automobile industry to bolt the flywheel to a flange, and the impression widely prevails that keying is not entirely satisfactory. In this connection it must be remembered, however, that the early engines had comparatively small diameter crankshafts and large, heavy flywheels (being mostly of the single or twin cylinder types). Since then crankshaft diameters have increased and flywheel weights have greatly decreased, and there should now be no difficulty in keeping the strain on the keys and keyways within permissible limits. It is the impulses or the variations in torque that are responsible for loosening of the keys, and these impulses naturally are greatly reduced in present day multi-cylinder engines. One of the reasons for reluctance to trust to keying has been that the flywheel is generally made of cast iron, which has less shearing strength than steel and consequently is more likely to develop looseness at the keyway. To overcome this difficulty a separate steel flange is sometimes keyed to the crankshaft and the flywheel bolted to this.

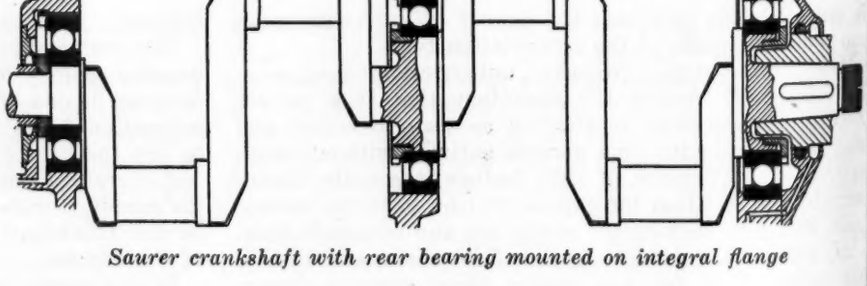
Where single row ball bearings are used it is generally desirable to employ bearings of a bore materially larger than the normal crank journal diameter, and the rear bearing is often mounted on the flywheel hub. In addition to obviating the need for using special parts for supporting the ball bearing, this practice has the advantage that it permits of the use of a long flywheel hub and of long keys without adding to the overall length of the engine.

A deviation from this practice is found on the crankshaft of the Saurer truck engine. Here the rear bearing is mounted on a flange turned integral with the rear arm of the crankshaft and the flywheel hub extends inside this flange—an excellent design but obviously quite expensive.

Some means must be provided in the crankshaft bearing mounting to take up the end thrust, which results chiefly from the operation of the clutch. A few designers employ, in conjunction with plain bearings for the radial loads, a special ball type thrust bearing for this purpose, generally located at the forward end of the crank. If ball bearings are used to take the radial load there is no need for a special thrust bearing, as the end thrust to be taken care of is comparatively small and the common types of annular ball bearings have considerable end thrust capacity. All that is necessary is that the bearing which is to take the end thrust have its inner race secured on the shaft and its outer race in the housing against endwise movement. The remaining bearings have only their inner races clamped.

If more than two bearings are to be used on a crankshaft a problem of considerable difficulty arises in connection with the mounting of the intermediary bearings, and this difficulty is probably the chief reason why most designers fight shy of this construction. Either the bearings must be stripped over the crank arms or the crankshaft must be built up of a number of units which are assembled after the bearings are in place. Stripping the bearings over the crank arms involves the use of bearings of comparatively large bore, thus restricting the designer in his choice of size and also adding to the cost; it also necessitates the use of a bolster ring made in halves, and of a clamping ring.

Recently more interest seems to be taken in the other alternative, that of the built-up crankshaft. In a four-cylinder three-bearing engine the crankshaft would be made in two parts with a joint at the center bearing, whereas in crankshafts with more than three bearings there would be a joint at each intermediary bearing. The design of such built-up crankshafts affords opportunity for the exercise of considerable ingenuity. There seems to be a tendency to build such crankshafts up of a number of similar units, either single throws or even separate main journals, crankwebs and crankpins. The advantage of this latter design resides in the fact that the individual parts are very simple and can be made cheaply on automatic lathes.

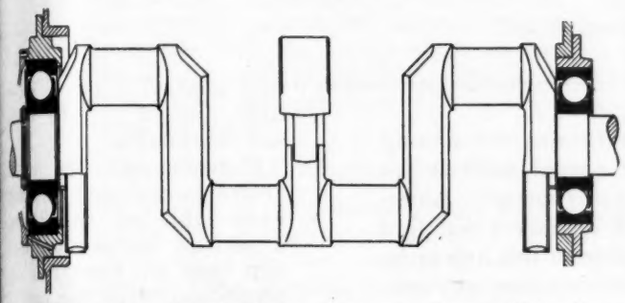


Saurer crankshaft with rear bearing mounted on integral flange

As regards the capacity of bearings used for crankshafts, there does not seem to be as yet a high degree of uniformity of practice. It is quite possible that in some cases mounting conditions lead to the use of bearings

larger than would otherwise be required. The capacity of bearings declines with their operating speed, and larger bearings, relatively, are used on high speed passenger car engines than on truck engines. The empirical rules for one particular class of crankshaft worked out in the following may be useful.

If the load rating of the bearing at the maximum speed of the engine is made equal to the maximum load coming on the bearing as the result of an explosion in one cylinder under full throttle at low speed, the capacity of the bearing should be ample. Assuming a four-cylinder, two-bearing crankshaft, in which each main bearing takes about 84 per cent of the load when an explosion occurs in the cylinder next to it, this works out about as follows:



Ball-bearing installation on Autocar four-cylinder engine

The maximum explosion pressure may be set down as 350 lbs. p. sq. in., hence the total pressure on the piston is

$$350 \times 0.7854\, b^2,$$

b being the bore in inches, and the load on the adjacent bearing is

$$0.84 \times 350 \times 0.7854\, b^2 = 230\, b^2.$$

On the other hand, the piston displacement of the four-cylinder engine is

$$4\, b^2 s \times 0.7854 = 3.1416\, b^2 s.$$

The stroke s averages around 5 in., and inserting this value we get for an approximation to the piston displacement $15.7\, b^2$. Hence the maximum load on each main bearing is $230/15.7 = 14.6$ times the piston displacement.

It is usual to make the rear bearing slightly heavier than the front one. Checking up the dimensions of the ball bearings of the four-cylinder, two-bearing crankshafts on which data were gathered, with this rule, it is found that for the passenger car engines the average rated load capacity at 3000 r.p.m. of the front crankshaft bearing is 14 times the piston displacement and of the rear bearing, 16 times. For the truck engines the average rated load capacity at 1000 r.p.m. of the front bearing is 12 times the piston displacement and of the rear bearing, 14 times. This applies to four-cylinder two-bearing crankshafts. These figures agree well with the theoretical deduction.

For engines with more than two main bearings on the crankshaft the calculations can be carried through in a similar manner.

If the main journals of the crankshaft are to be fitted with ball bearings, the question naturally arises whether the crankpins cannot also be so fitted, because any advantages accruing from the use of ball bearings as regards friction reduction and immunity from injury due to lack of lubricant would be equally important in this case.

The only practical way to use ball bearings on the crankpin is to make the crankshaft in parts and assemble it, and as the majority of manufacturers want to use a one-piece crank it rules out ball bearings on the pins. There is one other difficulty connected with ball bearings on the crankpins of high speed engines, and that is due to the fact that, owing to their greater weight as compared with plain bearings and the greater weight of a connecting rod head of sufficient diameter to receive them, the centrifugal force on the connecting rod head will be considerably increased. This force adds to the loads on the main bearings as well as to that on the crankpin bearing. The problem seems to be easiest of solution in case the crankshaft is supported in main bearings on both sides of each throw, as the pin diameters then need not be so large and a smaller ball bearing can be used. The crankcase, of course, also has to be made slightly larger in diameter in order that the enlarged connecting rod head may clear it.

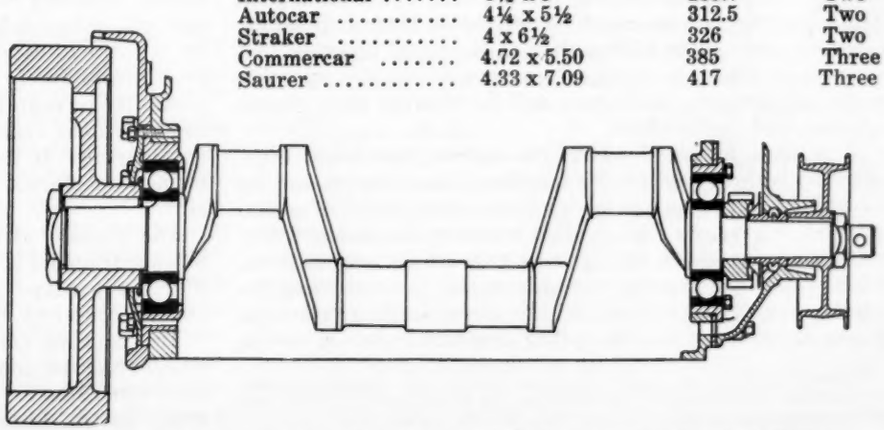
In considering the use of ball bearings on the crankshaft from the standpoint of cost, it must not be lost sight of that it permits of a considerable saving in connection with the lubrication system. For one thing, it is not necessary to drill oilways in the crankshaft, and the system of oil leads in the crankcase can be somewhat simplified. However, reduction in friction loss and greater life of the bearings are the chief advantages, and whether ball bearings will come into more extensive use on crankshafts depends on whether users fully appreciate these advantages and are willing to pay for them.

PASSENGER CAR ENGINE BALL-BEARING CRANKSHAFTS

Name	Bore and Stroke	Displacement	No. of Bearings
	Two Cylinder Engines		
Rover	3.34 x 3.45	61	Two
	Four Cylinder Engines		
Dorman	2.56 x 3.94	81	Two
Bristol Taxi ...	2.56 x 3.94	81	Two
Astral	2.72 x 4.53	105	Two
Dorman	2.72 x 4.72	110	Two
Vulcan	2¾ x 4¾	113	Two (rear plain)
Simson	2¾ x 5 5/16	126	Three
Vauxhall	3.34 x 5.20	132	Five (racer)
	Six Cylinder Engines		
Maudslay	2.55 x 2.94	122	Seven (roller)
Steyr	3.15 x 4.33	203	Four

TRUCK ENGINE BALL-BEARING CRANKSHAFTS

Name	Bore and Stroke	Displacement	No. of Bearings
	Two Cylinder		
Autocar	4¾ x 4½	159.5	Two
	Four Cylinder		
White	3¾ x 5⅛	226.4	Two
A. E. C.....	3.94 x 5.52	268	Two
Autocar	4 x 5½	276.4	Two
International	4¼ x 5	283.7	Two
Autocar	4¼ x 5½	312.5	Two
Straker	4 x 6½	326	Two
Commercar	4.72 x 5.50	385	Three
Saurer	4.33 x 7.09	417	Three



International Harvester truck engine crankshaft, a two-bearing installation

Design of Cars for Use in the Tropics Needs to Be Changed

Continuous, torrential rains; terrific heat; deep rutted roads; streams to be forded and sudden, sweeping changes in temperature are handicaps to be surmounted.

By F. A. Stepney Acres*

BRITISH colonial territories are among the most important export markets for automotive products. Consequently, American manufacturers and engineers will find much of interest and value in this article by a member of the British Institution of Automobile Engineers which gives his opinion as to the type of car which will best serve the needs of the British colonies.

IN setting out to capture or recapture distant markets, it is folly to think that it is necessary to produce a freak design, or to plaster the chassis with gadgets, just because an attempt is being made to reach a market in which the conditions are so very different from those at home.

In this paper, therefore, there is not a single suggestion that would render the vehicle unsuitable for the home market, nor one that need entail any extra expenditure. The vehicle outlined would be normal in appearance, normal in construction, and normal in performance. At the same time, every requirement applies equally to the commercial vehicle or the passenger machine.

The light medium powered vehicle undoubtedly will command the widest market, a vehicle which can be used as a passenger machine, and which can also carry a few hundredweight of goods. Such a vehicle must comply with many special requirements over and above those obtaining at home, which requirements the author has attempted to outline as broadly as possible.

Absolute waterproofness—as regards both mechanical and electrical details—is essential. The vehicle must be capable of negotiating deep fords, and of withstanding torrential rain for hours on end. The condition as to deep fords clearly indicates a totally inclosed unit construction of engine and gearbox, since, if efficient glands are fitted all round, the depth to which a vehicle so constructed may be submerged is limited only by the carbureter air intake, the high tension wiring or the exhaust tailpipe. As a general rule, carbureter and wiring will allow of a good depth, but the tailpipe must be carried as high as possible, certainly very much higher than is the usual practice. An exposed flywheel is fatal, since it will rapidly sprinkle water everywhere, and there will be trouble with clutch, ignition and carburetion.

A watertight gland which the author has found most efficient, both as regards its freedom from friction and its durability, is the spring loaded face contact type, of which a sketch is given in Fig. 1. Felt washers are useless; they merely absorb muck and grit, which act as an abrasive, while any other type of circumferential contact gland requires constant attention, and the accompanying frictional losses are excessive. The spring pressure required on the face contact type is quite light, and it can be made self-lubricating.

Unfortunately the brake drums cannot well be made watertight, but this is not a serious matter, provided that they are free from oil, which should be the case if the glands at the road wheels are efficient. Water alone appears appreciably to increase the coefficient of friction of the average brake lining, but if there is any oil present as well, the coefficient is reduced to practically zero; the effect of oil alone is very slight in comparison to that of the combination.

Coming to the question of protection from rain, we find that this can only enter through the bonnet hinges and rests, or from the front through the radiator. The common construction of bonnet with a longitudinal hinge along the top is distinctly dangerous in this respect. The Daimler type of bonnet, with its transverse hinge at the rear, and its one-piece top overlapping the side panels, is the only practical method of excluding drips on the top of the engine, which is, of course, the danger spot. If suitable felt pads or the like are fitted at the forward and rear ends, and the ends of the bonnet turned well in, such a construction can be made absolutely rainproof.

It is not quite so easy to deal with rain driving in from the front through the radiator, since the fan tends to distribute it very effectively. A fan of the Sirocco type, suitably encased, affords, however, a complete solution, since such a fan is totally inclosed at the back, and delivery is at the periphery only; it therefore presents no special difficulty to lead the whole of the discharge, water and air, completely outside the bonnet, or, alternately, to fix a baffle to catch the water while still allowing the air to circulate freely past the engine.

Ability to negotiate rough ground is absolutely the most indispensable feature of a vehicle such as that we are considering. It turns on two quite independent factors of equal importance, namely, ground clearance and suspension.

The average British manufacturer's idea of producing a colonial model is limited to packing up the springs about 2½ in., perhaps stiffening them slightly, straightening out the center of the front axle and leaving it at that.

To negotiate cart tracks it is essential that a standard wheel track be adopted and that the clearance close to the road wheels be even greater than that at the center of the axle. In this latter respect the dished wheel scores heav-

*Condensed from a paper presented before the British Empire Automobile Conference and published by the Institution of Automobile Engineers.

ily, since it is possible with these to get front steering pivots and front and rear brake drums completely outside the inner edge of the tires, the clearance line therefore becoming that of the axle itself. Care must be taken that none of the brake operating gear, levers or shafts project below the axle. The only other likely danger spot is the muffler, which must be carried as high as possible.

Roads with tranverse humps, on the other hand, call for a high clearance completely across the center of the vehicle, midway between front and rear axles. In this respect unit construction of engine and gearbox is helpful, since it moves the gearbox forward of the danger zone.

It must be possible for, say, the offside front wheel and the near side rear wheel to pass over hummocks at the same instant without appreciable frame distortion. With the ordinary types of suspension, however excellent, this practically entails that the vehicle must be capable of standing on three wheels only without distortion, and unless we entirely reconsider our ideas of frame construction, this is an impossibility.

Springs, Shock Absorbers and Radius Rods

The Ford system of transverse springs fore and aft goes some way toward meeting the difficulty, but not far enough. Since there are very serious objections to the three-wheeler for any purpose, it follows that the only complete solution of this difficulty is for either front or rear suspension to consist of a trunnion mounted transverse spring. From the point of view of stability, it is preferable for this to be at the rear, but for constructional reasons the front is better. Stability of the vehicle on curves is not sacrified to an appreciable extent.

An anti-rolling device, however, becomes essential, the simplest and most effective form of which consists of fixed straps from the frame passing under the rear axle. These also have the merit of definitely limiting the rebound, which is the most objectionable and the most dangerous feature of any excessive bump. With any suspension the effect of fitting such straps close to the axle in its normally loaded position has to be tried to be realized; on hitting a bad hole the expected bump just does not happen.

Ordinary shock absorbers, of course, do the same thing, but they are not particularly effective as anti-rolling devices. Such a trunnion mounted suspension gives the same result, as regards ability to surmount obstacles, as does the Pavesi tractor.

Radius rods are necessary with this construction, and these must act also as torque rods if front brakes are fitted. In this case problems of rigidity and operation are very much simplified. Steering connections also will need careful design, but present no real difficulty.

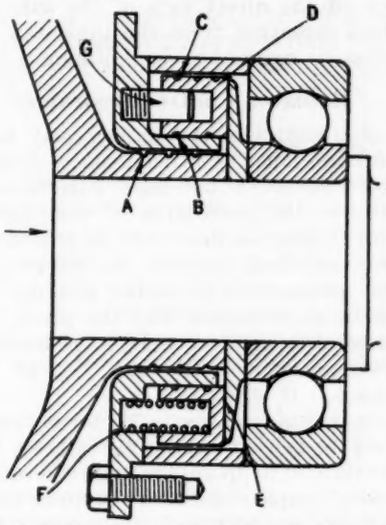
With this construction of front spring, the rear springing may be of any of the known types. Considered all round, the ordinary semi-elliptic form probably is the best.

Three Point Suspension Essential

If some such form of three-point suspension of the chassis is not adopted, we are faced with the certainty of more or less frame distortion, and it therefore becomes, in that case, an absolute essential that the engine be three-point mounted, one of the commonest forms of failure in rough country, when this is not done, being fracture of the engine arms. The radiator then must be spring mounted, or mounted on spherical trunnions, with a stay rod to hold it fore and aft. Such a stay preferably should be attached, not to the dash, but to the top of the engine, so as to relieve the flexible water couplings of distortion.

An extra big clearance between axles and frame must be allowed, and some form of buffer should be fitted. This is necessary for the shock of falling off an obstacle rather than of mounting one.

Minimum weight and maximum area of ground contact per wheel are two essential conditions in respect to ability to negotiate soft ground, and here again the dished wheel is particularly useful, since it is quite possible so to design the fixings that, if two spare wheels are carried, they can be fitted at a moment's notice in such a way as to convert the rear wheels into twin tired wheels. Although the cushion or balloon tire is still in rather an early stage of development, it complies very closely with the condition as to the maximum area of contact, and it appears from the reports of the recent London-Land's End trials that



At A there is a running clearance of say 0.01 *in. on the diameter, with an excluder helical groove. Block D is a sliding fit at B, and parallel grooves are turned in it, and these are grease-packed. At C there are also grease packed parallel grooves, but a small clearance may be allowed. Block D may be of any suitable material, for example, a piston alloy aluminum. It is held up to the face E by springs F, and is kept from rotating by pegs G. The shaft must be located endways. Since there is no relative movement at B and C there is no leakage past the grooves*

the cars equipped with these tires performed exceptionally well on the very rough surfaced hills.

In attempting to start a vehicle on soft ground the smallest amount of wheel slip merely tends to dig the wheels further in, and therefore a very smooth clutch and a practically self-locking differential are desirable. Smoothness of clutch engagement is dependent not only on the clutch itself, but also on the rigidity of the transmission shafts, etc.

If there is any serious angle of twist, due to shaft deflections, torsional or otherwise, or to tooth and coupling clearances, it becomes extremely difficult to obtain a smooth pickup; actually this is one of the most serious arguments against the so-called Hotchkiss drive.

Whether disk or wire wheels are adopted, the greatest care must be taken to prevent rusting around the rivets or the spoke nipples.

The largest practicable diameter of tire should be used, since it increases the ground clearance, facilitates climbing over obstacles, and increases the area of contact on soft ground. In fact, it is desirable from every point of view.

Ball or roller bearings must of course be used in the road wheels, even if only on account of their ability to run for long periods without attention. Water is their deadliest enemy, and therefore it is just as vital that absolutely watertight glands be fitted there as on the rest of the chassis.

Not only have we to produce a vehicle which shall be suitable either for a very hot climate or for a very cold

one, but in many parts of the world these extremes of temperature occur within the 24 hr., scorching hot days being followed by intensely cold nights. Therefore, ample cooling surface and draught must be available by day, yet provision must be made for maintaining the temperature of the water by night.

The ideal construction for such conditions is that in which the header tanks and radiator proper are separate from the radiator casing, and a shutter is fitted to the casing. This serves a double purpose, since the casing and the slats of the shutter in their horizontal, or open, position keep off the direct rays of the sun, while in the closed position radiation from the tanks, as well as that from the tubes, is reduced to a minimum.

Radiator Control Desirable

Thermostatic control of the shutter may be fitted, but, if so, hand control must be fitted also. Not only must the water capacity be large, but most careful consideration must be given to the prevention of even possibilities of leakage, since it may be necessary to travel considerable distances over waterless country. An efficient water pump is, of course, an absolute essential, and the water drain system must be so arranged that the pump can be completely emptied; the smallest amount of water left in the pump, if frozen, means a fracture of some kind immediately the engine is started.

In localities in which extremes of temperature are met, it is necessary to use an engine oil suitable for the condition of maximum temperature, and therefore oil passages must be of ample dimensions in order that they may be capable of dealing with a fairly heavy oil under conditions of minimum temperature. In one system using 5/16 in. bore oil tubes there were four 5/32 in. holes opening into the troughs. Failures occurred only if the throttle was opened fairly wide before the engine had time to warm up properly. Investigation showed that with cold heavy oil the pressure at the pump outlet was somewhere in the neighborhood of 300 lb. per sq. in. at about 1500 r.p.m. of the engine. Eventually external pipes were increased to ½ in. bore, and the relief valve discarded, and the trouble then completely disappeared. This is a lesson that we cannot afford to ignore.

Electrical Equipment Must Be Carried High

It is just as essential for the electrical equipment as for the engine to be watertight. Magneto, generator and starter therefore must be carried as high as possible on the engine, and the flange fixed type should be used wherever possible. Both generator and fan, if at all possible, should be direct driven.

Special care must also be taken with the wiring, generally one of the most neglected details; switches and switchboard, too, must be so arranged and located that water cannot possibly enter; particularly does this refer to ignition and starter switches. In addition to the ordinary lighting equipment a powerful swiveling searchlight under the driver's control should be fitted.

The question of ignition is a debatable point, but if a single system only is fitted it undoubtedly must be a magneto system. The author would very much like to see the old Bosch Duplex system revived.

Although the fitting of two independent systems is a necessary precaution against failure, there are many disadvantages also. A dual system operating on one set of plugs is no real safeguard, since it calls for a combined high- and low-tension switch—by nuo means a desirable fitting.

If two sets of plugs are fitted they must be kept continually in operation, otherwise the unused set will foul up so as to be useless when required, while if they are in simultaneous use, it is quite possible that one system may have gone out for some considerable period without the user's knowledge, unless he takes the precaution of cutting each out periodically to test them, so that when failure does occur, it is just as complete as if only one system were fitted.

The position of the coil, if such is used, is most important; it must not be near hot exhaust pipes, but it must be kept absolutely dry.

There are certain districts in which wear, particularly on the bearings, is excessive, owing to sand and dust finding their way into the engine. If efficient glands are fitted, the only means by which dust can enter is either by the crankcase vent or by the carbureter intake. The particles are too small for filtration of either air or oil by means of gauze or the like to be of the slightest effect, but it seems quite feasible to suggest that some form of high-speed centrifugal separator might give quite satisfactory results, particularly in cleansing the lubricating oil, which is really the more essential of the two, since most of the damage is done by the sand mixing with the oil, and thus being pumped through the bearings. Such an oil separator would not be a particularly expensive item.

Location of Drain Cocks

Effective and accessible water, oil, and fuel drain cocks must be fitted. The average ⅛ in. bore cock is useless. They must be so arranged that there is no possibility of their being broken off or of opening inadvertently.

There is need for large water, fuel, and lubricating oil capacity. Pressure-feed for the fuel is undesirable, owing to the duplication of pipes and the consequent increased risk of failure. Vacuum-feed systems have many advantages over pressure, but careful attention must be paid to their fitting and to the filter arrangements. A main fuel cock within reach of the driver should be a compulsory fitting on all vehicles, and both vacuum and gravity systems lend themselves to this very well. Cowl fuel tanks are particularly dangerous and objectionable in hot weather, unless the filler is forward of the screen; also they do not lend themselves to a large capacity, but otherwise they have much to recommend them, owing to the simplicity and reliability of a direct gravity feed.

To overcome any difficulty in starting from cold in extremely low temperatures, priming cocks are a necessity.

A positive drive if at all possible, must be arranged for generator and fan. Belt drives are totally unsuitable for the climatic conditions likely to be met with.

Since flexible water connections are very likely to perish, they should be so arranged that they can be removed and replaced without disturbing any other parts or joints.

Without going into the vexed question of three speeds or four, it can be definitely stated that three are sufficient; the first speed must be low, and the reverse still lower. The fairly high-ratio reverse not uncommonly found on four-speed boxes is totally unsuitable for rough country.

Provision Needed for Getting Out of Holes

A sprag of some kind should be provided owing to its great value in getting out of difficult places. The best form is the ratchet type at the back of the gear-box; then, of course, it must be so arranged that it is thrown out of engagement automatically when the reverse is engaged.

Brakes most certainly should be fitted to all four wheels. Here again it is their extreme value on awkward pitches and stiff gradients that makes them essential, rather than any question of high speeds.

The use of rustless steel for all small brake and control pins and forks cannot be too highly recommended.

On many vehicles it is a most difficult matter to attach a tow rope. When this is the case tow-hooks should be

fitted front and rear, since animal haulage out of difficult places is an eventuality to be faced, quite apart from the ability to haul farm implements or the like.

It would be a very great convenience if the running-boards were made very much stouter and wider than usual, and to lift out readily, for use in helping the vehicle out of soft places.

An extra long lift jack must be provided, with a good base, and short enough in the down position to be inserted under the axle even when the wheels have sunk into the ground fairly deeply.

Eventually Radio Equipment Will Come

Although the time is hardly ripe yet for suggesting it as a standard fitting, there is no doubt that in the not very distant future a wireless transmitting and receiving set will become a necessary part of the equipment, at any rate for use up-country. The ordinary lighting equipment provides ample power for this.

The question of the capital locked up in stocks of spares is a very serious matter, and is very much aggravated by the multiplicity of models, and the continual change of models practised by the majority of manufacturers, so that continuity of policy would appear to be a prime essential in dealing with a world wide market. The actual quantity of spares stocked is also generally settled in a very haphazard manner. This is somewhat unavoidable when a new vehicle is first put on the market, but a careful analysis of all failures and all replacements should soon enable these stocks to be fairly accurately adjusted. A system of replacement charts is of great help in this respect.

If any part is found to be weak in design, either by actual failure or undue wear, any revision must affect, as regards interchangeability, an absolutely irreducible minimum of other parts.

High Speed Engines Not Suitable

Small high speed engines are quite unsuited to colonial conditions; that alone is probably one reason why the American manufacturer has ousted us. The author is strongly of opinion, and he is not alone in this respect, that even in this country it is but a passing phase, artificially nourished by taxation and competition ratings, and that we shall ere long see a gradual return to the larger and woolier engines, except, perhaps, for the so-called "sporting models." A really long day's journey behind both types soon would convince the most skeptical. Sturdiness of design is particularly to be studied in the case of the axles, the rear axle especially, this being the commonest point of failure. Sturdiness does not, of course, necessarily mean the same thing as heaviness—light weight is of very great importance.

Just as much care must be given to the body as to the chassis, since it is even more sensitive to climatic conditions. It is especially essential that only thoroughly seasoned timber be used, and it is very desirable that the body be made readily detachable in order that colonial owners may be able to fit a special purpose body when required.

The following additional notes on design, extracted from the paper submitted by Mr. Rouch, are given below because of their bearing on the same subject. They deal with general specification of the cheap passenger car deemed suitable for British overseas markets.

The private passenger car should have a short turning radius, standard track and wheelbase, and the fuel consumption must be at least 30 m.p.g. (presumably imperial gallon).

The body should seat five, with plenty of leg room for all occupants, and afford special seat comfort, for many overseas users are frequently two or three days at a stretch on the road. The driving seat should be adjustable. The front compartment should be fitted with dash ventilators, the exhaust pipe well insulated from all parts of the body and a good tool kit provided in an accessible position. Tops should be of sufficient height to allow easy ingress and egress. Top fabrics employed on European cars are not suitable, owing to the strenuous service. They are not only unsafe protection against the sun, but do not stand up under a tropical downpour.

Sales and publicity managers should see the finished sample cars of a new model before they are put into production, and closely criticize their lines and appearance.

The driver's seat should be accessible, with controls on the right side.

Tires Provided in Inch Sizes

Tires should be preferably in inch sizes, as overseas markets are principally stocked with such sizes, and in a few years millimeter sections may be difficult to obtain.

The body should be painted in light colors, which do not show the dust, and a choice of, say, three standard colors is advisable. The top should be gray or khaki, black being unsuitable. Radiator shell, windscreen uprights, headlamps and similar fittings for cars for the tropics should be nickel-plated, in fact, the more nickel-plating the better, as almost every car owner has a chauffeur.

Cars for Australia or New Zealand, on the other hand, should be finished with a view to saving labor in cleaning. A good speedometer *not* driven from the front wheel, and a useful dashlamp, are as essential as the spare tire.

A really good mechanical tire pump should be incorporated in the engine. Such a fitting is a blessing when a customer has tire trouble when the temperature is 100 deg. in the shade, but if a fitting is supplied which has to be stuck in a spark-plug hole, or which entails any messing about near the engine to set up, the result will be burnt fingers and ill will, for engines run very hot in some countries.

For overseas models, the attention of the designer should most certainly extend to the tool kit, and especially the jack. This is a sore point, but if manufacturers will only realize that many of their cars will be operated under conditions of acute discomfort for the operator, and if they will endeavor to save him trouble and effort, they will be repaid. Motoring is often a stern necessity in the tropics.

Engines Should Be Water-Cooled

Engines should be of 12/14 hp. with four cylinders, and *must* be water cooled. They should have a detachable head, camshaft drive by gear, or good and easily adjustable chain. Valve tappets should be easily adjustable, valve springs easily removable and not liable to break, valves should be interchangeable. Timing gears should be accessible and the operation of timing made as easy as possible. Lower half of the crankcase should be easily removable, and pistons and connecting rods removable either from above or below the cylinder block.

Engine bearings should be generously proportioned, and special attention paid to their ability to operate under extreme conditions of temperature.

For overseas use a battery of greater capacity than that fitted for the home market is very advisable, and designers would do well to include one of the batteries for which world wide service station systems are being installed. Batteries usually are called on to do far more onerous work abroad than at home, and under more trying conditions. The author has not yet seen a battery really specially designed for tropical conditions, but such a unit would fill a decided want.

A steering lock of 30 ft. radius should be provided.

Track should be 4 ft. 8 in. or as near as possible to this.

Carbureter and ignition controls must be on the steering wheel. Cars may be driven for long periods on fixed throttle and ignition settings, and these controls will be much in use.

A right hand gear and brake lever would provide an excellent sales point, if well designed so as to allow free use of the door to the driver's seat. The right-hand gear control is not insisted on, but is popular with all classes of users. The accelerator pedal deserves special attention. Provision must be made for resting the foot, and the driving position in any case must be quite comfortable.

Steering Wheels Should Not Be of Wood

The electric horn button should be mounted on the steering-wheel boss, and the wheel should not be of wood. The variations of climate and the trying conditions frequently cause wooden steering wheel rims to shrink and open up.

Abutments under the axle casing for the lifting jack would be greatly appreciated by users.

Rear axle and differential must be of solid construction and capable of standing great abuse. Easy repairs or removals should be possible. When designing the larger units, such as rear-axle casing, gear-box, engine base-chamber, etc., it should be borne in mind that these often will have to be removed in unfavorable conditions by inexpert people, packed up, and sent for long journeys to a repair shop.

The footbrake should operate on the rear wheel drums and the handbrake on the gearset. Badly designed American transmission brakes have created a noticeable amount of prejudice among users of cheap cars. Ordinary brakes are not good enough for overseas service, something really special is required, and attention should be paid to the question of adequate cooling of the drums. The runs down from Indian, Burmese, or East African hill stations, or down some Australian and New Zealand mountains, will find any weakness in brake design. The question of brake wear also is important to owners of motor hill services.

Springs Should Be Easy to Replace

Rear springs should be elastic but exceptionally strong and easy to replace; most British and American cars are too stiffly sprung for overseas conditions, and riding is uncomfortable and broken springs are plentiful. Good provision for lubrication of the shackle bolts is a primary essential. The weight should be kept down to the lowest possible limit. The ordinary British car of this class is far too heavily built for overseas service, and the American car often too light.

In the discussion which followed the reading of these papers W. T. Chatfield disagreed with Mr. Acres in regard to the disappearance of the high-speed engine for Colonial markets, as he considered that it was quite suitable where good roads exist. He pointed out that the clearance under any parts of the car should be at least 10 in., measured when the car is fully loaded and not when light—a point too often overlooked by British designers. He pleaded with designers to pay greater attention to springs and to body work that would retain its newness for long periods, and for a car light in weight and yet of greater horsepower than that asked for by the author. In appealing for good and lasting finish he recommended that the body should be stove-enamelled.

W. S. Sholl recommended the fitting of a controlled extra air-valve on the carbureter, as tending to economy, and providing an air brake for long descents. In discussing electrical equipment he urged that the generator should be capable of an output of 10 amp. at a car speed of not more than 15 miles per hour. Batteries should not be carried on the running boards for they should be left perfectly clear.

Ratio of Power to Weight

He also urged upon designers the necessity for greater consideration being given to the ratio of power to weight and that the direct drive should not be higher than 4.5 to 1, as moderate speeds are generally called for throughout in preference to alternate crawling and bursts of speed.

He put forward the necessity for an off-side front door to give the driver egress in difficult places and made the excellent suggestion that spare wheels should be carried at the rear of the vehicle, on a bracket sufficiently strong to act as a tire-changing stand. He severely condemned the author's suggestion of nickel-plating on any part of the car, owing to the dazzling effect on one's eyes under a tropical sun.

In regard to suspension, he suggested that wider springs than those usually fitted would make for easier riding and greater durability and that the springs should be bound with rawhide thongs in preference to the ordinary gaiters. After a plea for a really carefully drawn up instruction book, he put forward a tentative specification, embodying an engine at least 80 mm. bore by 140 mm. stroke, with a wheelbase 9 ft. 6 in., semi-elliptic springs, and a weight under one ton if possible, at a price not greatly exceeding £300.

Capt. E. A. Rouch objected to the larger engine on the score of cost and economy of petrol consumption, while repeating his suggestion for nickel-plating as a good selling point, at all events in the Orient.

Cars at the Empire Exposition

L. A. Legros gave the results of a careful examination of the cars actually shown at the Empire exhibition as being suitable for the colonies and stated that in his opinion only 9 of the 48 shown were suitable on account of the small clearance allowed, not always below the axle, but below brake levers, worm gear casing, etc. In condemning the jacks usually supplied he put forward as an alternative a piece of wood 4 in. square at one end, tapering to ¾ in. in depth at the other end and about 30 in. long, on to which the car could be run, the jack then being inserted just to take the weight off the wedge and allow easy removal of the tire.

Col. R. E. Crompton drew attention to the temperature which a spanner would attain if left in the open under an Indian sun, and suggested that cars for tropical countries should be painted dust color.

In discussing the second paper H. Wyatt urged that steps should be taken to alter the basis of customs duties to one of weight instead of *ad valorem*, pointing out that the heavy vehicle should pay more as it would tend to do greater damage to the roads of the country.

He expressed himself as strongly in favor of advertising in the lay press of the colonies and not in the technical press, giving as one of his reasons that in a recent report of the Olympia show in a certain overseas technical paper it was stated that 76 British cars and 18 American cars were exhibited, but descriptions were given of only 18 of the British cars and of 17 out of the 18 American cars.

W. T. Chatfield suggested that British manufacturers might find it economical to export cars as components, and set up assembly plants in different countries. He urged that much greater attention should be given abroad to the question of service.

W. S. Sholl, while agreeing that American methods of packing were inferior to British methods, stated that the latter were almost too good.

Just Among Ourselves

S. A. E. Is Seeking and Expects to Find

NOW that the summer meeting of the Society of Automotive Engineers is over, everybody is speculating about where the next one will be. It is pretty generally agreed that it will not be at Spring Lake, for a variety of reasons.

Edgewater Beach, located near Chicago; Mackinac Island, and White Sulphur Springs seem to be the leading places under consideration. L. C. Hill, assistant general manager of the S.A.E., has just returned from a tour of investigation and reports some highly favorable features in all three resorts mentioned. There is always a lot of discussion about the place selected for the summer S.A.E. meeting after the session is over. It would be a good thing if more opinions were expressed beforehand. The committee making the choice certainly would be influenced materially by suggestions.

While we're on the subject of the S.A.E. summer meeting, it may be just as well to get out of our system the idea that the section stunts, which provided so much real fun in the past, should be revived. These stunts seem to have remained in the minds of everybody who witnessed them and to have provided vivid and pleasant memories which can't be induced by more artificial "stimuli"—as our friends the psychologists might put it.

What Would Dealers Do with Bigger Discounts?

"DEALERS ought to get longer discounts if they knew what to do with them," said the secretary of a local dealers' association the other day. "But," he added, "I am afraid that a good many of them would just trade away any increased margin that might be given. What they should do is to try to get longer discounts and then use them to attract higher grade and more efficient salesmen. One or two dealers in this town have discounts as high as 40 per cent. They happen to be sensible merchants and they are using their large margin very effectively. They are making money." The theory that cars should be priced high enough to permit larger discounts has been propounded by various men in the industry. A few of them have tried it. Some have been successful; others have not. As a matter of fact, so many other factors are involved in profit-making that the question of discounts cannot be discussed very profitably by itself.

Ring Out the Old; Ring in the New

THE new model season is with us. Every week brings something interesting from an engineering and merchandising standpoint. Inevitably the old discussion about the sales value of new models has taken on new life within the trade. Many distributors and dealers think that the trouble experienced in getting rid of old models hurts their profits more than the sales stimulus derived from the new ones helps. The idea that announcements should be made in January rather than in the middle of the summer selling season has a lot of support among the retailers. There are good reasons for bringing out new models as well as real difficulties in properly presenting them. When dealers get a fair chance to clear their floors of old stock before the new models are shipped to them, a very real stimulus to sales often results. Manufacturers are getting some good ideas from their retail organizations, at any rate, about the whys and wherefores of new models.

Trade Days Plan Going Over Big

THE plan of having two special trade days at the national automobile shows this year is going over big. Several very important parts makers who previously have exhibited only in hotels already have said that they will be in the show this year. Some executives don't like the idea, of course, but an overwhelming majority seem to favor it strongly. The new plan is serving to center attention on the shows and to get everybody in the industry talking about them whether it does anything else or not. Few executives will want to miss making a personal investigation to see the trade days' plan in action. The installation of special trade days seems likely to make the shows result in more business and less bunk than at any previous time.

When Royalty Renews Regal Riding Equipment

GREAT excitement in England! The King has bought a new automobile for the first time in fourteen years. His Majesty has rewarded good service, however, by purchasing a new model of the same make which has served him so faithfully. We don't know how much canny business methods enter into such royal transactions, but we can't refrain from wondering whether or not his royal highness got a good allowance for his used car. N. G. S.

Crankcase Oil Dilution Causes Increased Wear, Carbon Formation and Corrosion

Answers to S. A. E. questionnaire show considerable difference of opinion as to how far oil can be diluted before it will cause serious results and how often oil should be changed.

ACCORDING to returns received from a questionnaire sent out by the Research Department of the Society of Automotive Engineers, dilution of crankcase oil by fuel is greater when air and jacket water temperatures are lower, increases as less volatile fuel is employed and with mixtures which are over-rich. Increased wear, danger of piston seizure, noise, carbon formation and corrosion are mentioned as among the effects of dilution. There is, however, considerable difference of opinion as to how much dilution is permissible without serious results, how often the oil should be changed, what effect piston and ring design may have and what remedies are necessary.

The following summary of the replies submitted by 26 engineers representing prominent firms in the industry has been prepared by the S.A.E. Research Department:

Effect of Weather or Outside Air Temperature.—General agreement is found among the replies that lower air temperatures result in increased dilution. This is accounted for by the increased difficulty of starting and bringing the engine to stable operating conditions. Excessive use of the choke and difficulties in vaporizing the fuel are given in several cases as the direct consequences of low air temperature that tend to increase dilution.

Effect of Jacket Water Temperature.—All but one of the replies indicate that lower jacket water temperatures mean increased dilution. The influence of this factor is said to be less for trucks than for passenger vehicles. Temperatures above 140 deg. Fahr. are advocated in one case, whereas a range of from 160 to 170 deg. Fahr. is recommended in another instance. Incomplete vaporization and combustion of the fuel and the requirement of richer mixtures are given as contributing causes of greater dilution with colder jacket water. Fifty per cent dilution was found in a test in which the engine was run continuously for a day with cold water circulating through the jackets.

Effect of Fuel Volatility.—Increased dilution is believed to accompany decreased fuel volatility. Again, the lesser effect on commercial vehicles is brought out. Incomplete vaporization and combustion and the necessity for higher oil temperatures to drive out dilution are given as causes for greater dilution with heavier fuels.

Effect of Mixture Ratio—The reports agree in general that over-rich mixtures cause excessive dilution. One reply states that the important result of having the mixture too rich is the contamination of the crankcase oil by carbonized particles.

Effect of Piston and Ring Design.—Nine of the 16 definite replies with reference to this item indicate that piston and ring design haye a bearing upon dilution, whereas six report little or no effect. The importance of using proper material for cylinders, pistons and rings is emphasized by one reply.

Effect of Wear and Piston Fits.—Ten of the 13 replies that refer to the effect of wear and piston fits indicate that these factors influence dilution. Three replies take the opposite view. The need for an effective seal between the piston and the cylinder is mentioned as a reason for having good piston fits and for keeping wear at the minimum.

Injurious Effects of Dilution.—Increased wear, noise, danger of seizure, carbonization and corrosion are mentioned among the injurious effects of dilution. Few cases of seizure seem to have been experienced. This is accounted for in one case by the increased clearance that results from greater wear with high dilution.

Danger Line of Viscosity.—No reply includes an explicit statement concerning the minimum allowable viscosity for good operation. This indefiniteness is explained in several cases by the presence of variables such as, the character of lubricating systems, bearing types and proportions and contamination by dirt. One statement proposes 15 per cent dilution as representative of the safe minimum of viscosity and another differentiates between new and old engines; the latter recommends 15 per cent in the case of new engines and 25 per cent in the case of old engines.

How Often Should Oil Be Changed?—Recommendations as to frequency for changing crankcase oil vary from 300 to 2500 miles under winter and summer conditions respectively. No marked agreement is noticed among the replies.

What Remedies Are Necessary?—Improved carburetion and distribution, thermostatic control of jacket-water temperature, the maintenance of a warm oil pan, the filtration of oil and the cleaning of air, means for quick starting, the use of automatic radiator shutters and the elimination of the choke are mentioned as possible remedies for excessive dilution. Education of automobile operators also is thought advisable.

Discussion Suggested.—Among the recommendations for suitable subjects of discussion and research the following are mentioned: the use of automatic hood shutters; the use thermostats, oil cleaners and renovators; the amount of wear directly traceable to dilution; the danger point of dilution and viscosity; engineering facts concerning dilution, to be given in popular form for distribution among operators; facts and conclusions of engineers who represent the passenger car, truck, tractor and oil industries.

Passenger Car Experience of Limited Value in Making Truck Sales

Experience teaches need for radically different methods in commercial vehicle field, factory executives say. Car dealers need specialized knowledge if they are to add trucks to line.

By W. L. Carver

A TREND has developed toward adding related truck lines to existing passenger car lines in recent months and apparently the intention is to market these commercial vehicles through regular dealer organizations for the most part. This movement brings into fresh perspective the whys and wherefores of truck merchandising as related to methods designed to sell passenger carrying vehicles. Builders and dealers of some of the older established lines of trucks are inclined to criticise the combination truck-passenger car dealer idea, while some other merchandising experts in the industry see good possibilities in it.

Conversations with men experienced in truck marketing reveal a general agreement on the need for specialized sales work in truck retailing, and show certain fundamentals that have been evolved through several years of experience in comparing the merchandising methods which have been successful in the truck and passenger car fields.

From the merchandising angle, trucks and passenger cars have but one point in common, and that is the similarity of some of the constructional details and the fact that both require gasoline, oil and water for their operation. From the standpoint of function, sales appeal, potential markets and merchandising methods, the two vehicles occupy different planets. The similarity in component units which exists is of a service rather than a purely merchandising character and until sales and service become more synonymous generally, this asset is not to be over-rated.

Criticising the Average Dealer

Wherever men interested in automotive lines get together, the conversation ultimately leads around to the average dealer and his shortcomings. Shop executives, purchasing agents, advertising men and a host of other interested executives, all make about the same comment and arrive at about the same decision regarding the average dealer. They state that he is not a merchant, but that he sets a few cars out on the floor and expects the eager public to come in with cash in hand and strong-arm these cars out of his possession. The number of dealer places where the interested person can go in and roam around unmolested by an enterprising salesman is by no means limited. Too often a relatively small amount of work in the field is done by salesmen.

It is this condition that draws the most stringent criticism from the truck men. One of them says, "If our dealers were to put a few trucks on the show room floor and then sit around and wait for customers like some car dealers do, this plant would have closed its doors long ago. The fellow who thinks he can graft on a line of trucks to bolster up the flat spots of his car business is barking up the wrong tree. All trucks have to be sold while many cars are bought.

"We have to go to our customer loaded with every available bit of information pertaining to our line and he does not buy because the job looks nice. Style does not count, what he wants is the most transportation for the least money. In other words, we must sell a service with emphasis on both sell and service. The average car dealer will not get away with truck selling. The unusual dealer, who is a real merchant will, because he will organize his truck effort consistently for the long haul just he has already organized his passenger car sales effort."

Basic Differences in Sales

In commenting on the basic difference between passenger car and truck sales, another truck executive says, "When the average American citizen makes up his mind to buy a car, the process is about like this. If he is a thrifty working man he shops around a while and then buys a Ford. It is this tendency to shop around that has deceived a lot of car manufacturers and dealers into the present condition of over-expansion. If, on the other hand, he is rather wealthy, and pretty well assured of his position in life, he buys what he wants in the upper price class. These two types comprise about half of the potential buying power. The third and largest type looks them all over, prices them and then makes up his mind what he can get by stretching his credit and buying power to the limit. Thrift often is sacrificed to the possibility of making a showing before the community. On top of this, what the buyer can see counts rather than what is inside of the job, although the public is gradually becoming more motor-wise.

"As against this, we, in the truck field have to go out and sell our jobs from radiator to rear tires and adapt our truck and sales methods to the last detail of the customer's characteristics. Perhaps the addition of a truck to some dealers' lines will be an excellent educational element that will ultimately improve their methods of selling cars."

Analysis of these statements brings out certain highlights of opinion and experience that should enter into the policies laid down by any manufacturer who contemplates a related line of trucks. The outstanding points may be listed as follows:

1. Outside of the similarity in mechanical details, the truck has nothing in common with the passenger car.
2. For the present, the service department is the only common point of contact.
3. The truck is sold almost entirely on its utility and ability to perform certain functions of transportation at the minimum cost.
4. Style, elegance, appointments, etc., although as yet underestimated by dealers in machine passenger car sales, have a tremenduous influence on the car customer, but count for very little in the truck field.

5. The truck can not be handled as a side line to the passenger car field or as a filler of flat spots. Neither can it be handled as a training school for passenger car salesmen. A separate field of effort is involved in an entirely different type of market, a market fit for the star salesman rather than the dub.

6. The most thorough knowledge of the product and possibilities based on cost of operation in different fields will be required by the salesman.

7. Intelligent effort in the truck market will have a good effect on the dealer's methods of marketing passenger cars.

When it is remembered that the truck industry has been growing at a more rapid rate than that of the passenger car industry for the past two or three years, and that many of the most successful truck manufacturers have their own branches in all of the larger communities, some thought must be given to organization before allowing a passenger car retailing organization to embark in the commercial field.

Chain Window Lift of New Type Developed by Parsons Mfg. Co.

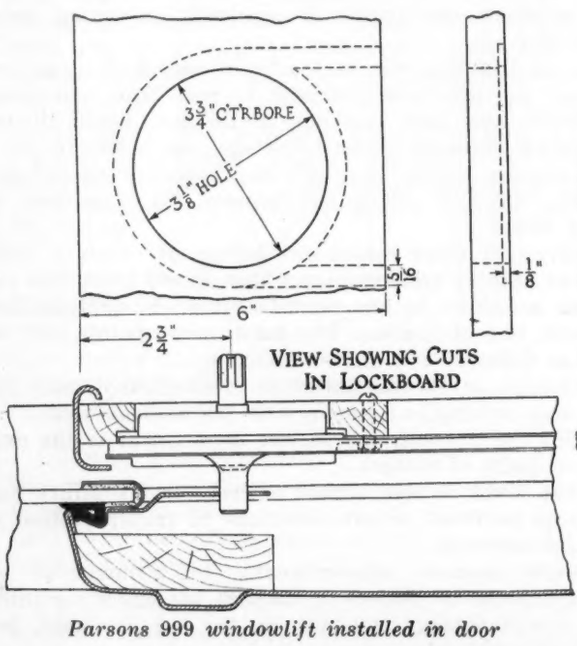
THE Parsons Mfg. Co., Detroit, Mich., has developed a new type of chain windowlift which exerts a pull on the glass along its center line. Among the advantages claimed for it are durability, ease of installation, simplicity, light weight and positive operation.

The lift, ready for installation in a body, is contained in a thin, two-piece, pressed steel housing. The back half of this housing has an internal gear riveted to it at its upper end and on its inner side. Meshing with this gear is a pinion which is mounted on an eccentric on the operating shaft. The combined eccentric rotational and rolling motion of the pinion is transmitted to the chain sprocket as simple rotary motion by means of an equalizer. This part is located between the pinion and the sprocket. It is shaped like a washer and the hole in its center is sufficiently large to permit its necessary lateral movement with respect to the shaft. On each side of the equalizer there is a diametral slot, the slot on one side being perpendicular to the one on the other side. Two diametrically opposite lugs on the face of the pinion fit into the slot on one side, while two similar lugs on the sprocket fit into the slot on the other side. As a result of this lateral freedom, the equalizer translates the compound motion of the pinion into simple rotary motion of the sprocket.

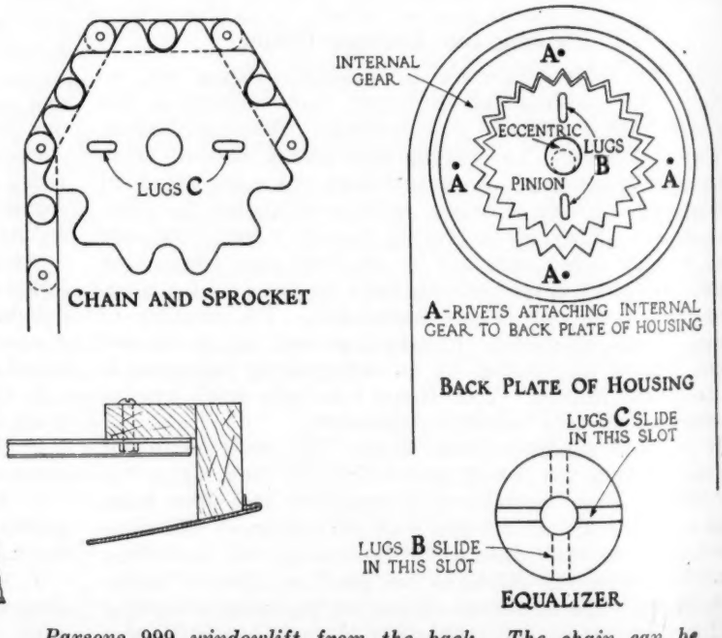
The lifting chain, which is a patented design, runs in guides formed by the pressed steel housing. It has pressed steel links and each link has a circular lug which fits between the teeth of the sprocket which are shaped for the purpose. The arm which moves the window is attached to the chain near one of its ends. When the window is closed, the major portion of the chain is in one guide; when the window is lowered, the chain passes over the sprocket into the guide on the other side, and when the window is raised, the process is reversed. Of course, the length of the chain is proportioned to the lift required, so that its ends will not leave the guide on either side. As the chain slides vertically in the guides, the lifting arm also moves in a straight line and, consequently, the force applied to the window is rectilinear. Placing the point of application of the force in the center line of the glass is merely a matter of positioning the lift in the body. The weight of the window is counterbalanced by a ribbon spiral spring.

Positive operation in both directions is secured by providing a minimum clearance for the chain in its guides. As a result, the chain cannot buckle under compression. Furthermore, the chain is held so tightly in its guides that no rattles can develop. The lift is self-locking in any position, as the mechanism for rotating the sprocket is irreversible.

The weight of the complete lift is said to be less than 3 lb., many of the parts being of pressed steel.



Parsons 999 windowlift installed in door



Parsons 999 windowlift from the back. The chain can be seen through the opening in the guides on either side

Editorial

Cooperative Education

THE Automotive Equipment Association started in several years ago to demonstrate the practical value of cooperative merchandising educational work. Now the National Automobile Dealers Association comes along with a proposal to spend $25,000 next year in a definite effort to make dealers better merchants and asks the National Automobile Chamber of Commerce to add a similar sum for the campaign.

Every manufacturer has something to gain from an effort of this kind. Unlike educational work done by individual companies, cooperative efforts of this kind are almost certain to advocate only such methods and ideas as will be of broad and permanent value to everybody in the industry. In addition to their immediate educational value, such cooperative campaigns tend to focus the attention of everybody—manufacturers as well as dealers—on certain outstanding problems and to get sufficient force behind a single idea to accomplish something definite.

While the details of the N. A. D. A. plan have not been announced, the general idea is one which should have the most careful consideration of the N. A. C. C. as an organization and of vehicle manufacturers as individuals.

Engines Which Warm Quickly

NEARLY all recent research work dealing with the effect of fuel and water on lubrication has made it evident that an engine which attains a good working temperature quickly is less apt to suffer from trouble due to dilution and water contamination of crankcase oil than one which heats up slowly and perhaps never attains a good working temperature during average short run service.

This points to the desirability of having a minimum amount of water in the cylinder jackets and of preventing circulation until a good working temperature is attained. Granting this, a narrow jacket space has obvious advantages, providing proper circulation is assured.

Another desirable arrangement, used to advantage in some aircraft engines and equally applicable to automobile engines, is one in which the water is brought in near the top of the jacket and close to the hottest parts, such as exhaust valves and spark plug, and is not positively circulated through that part of the jacket which surrounds the cylinder bore. This enables the cylinder walls to attain a desirable temperature quite quickly, the water surrounding them being circulated only by thermosyphon action, while parts likely to overheat are kept cool by the forced circulation around valves and head.

An engine having this arrangement undoubtedly will attain a suitable operating temperature quite quickly, especially if jacket space is narrow, and consequently should be more nearly free from dilution troubles than engines in which the cylinder walls are kept too cool.

Standardized Starting Cranks

SOME one has suggested to the S. A. E. Standards Committee that starting cranks should be standardized, so that if a motorist while on tour should find that his self-starter did not work and he had left his starting crank behind, he could get a duplicate of the latter at any automobile supply store.

The idea seems to be an excellent one and quite practicable. If followed out it would certainly eliminate one form of "grief" in the use of motor cars. At the present time, when hand cranks are so rarely used, it is a very common thing for careless drivers to leave this part of the equipment behind, greatly to their regret if their battery runs low or something else occurs to make the electric starter inoperative.

If the suggestion should be taken up and a standard design for a starting crank worked out, an item could be included in the specifications which requires the hardening of the jaws. The jaws of the cranks furnished with some of the cheaper cars at least are now made of very soft steel and left unhardened, making the starting crank unserviceable and even dangerous.

Retail Sales

THE merchandising experiences of 1924 have brought car manufacturers to a practical realization of the previously understood fact that retail sales are the real yardstick by which production programs must be measured. It would be to the interest of the whole industry if reliable and fairly complete figures showing the number of retail sales were available from month to month. General Motors Corporation already has begun to make public such data concerning the retail activities of its organization.

Monthly and quarterly production figures have been obtainable and have been used to great advantage in making business plans for many years past. The output of many individual companies still is held confidential, but enough data are available to the man who needs them to make a very complete analysis.

Now the industry is entering a new phase. Retail sales figures are needed for intelligent planning. Whether they be compiled confidentially as are the production figures or whether they be published broadcast is not so important as is an effort to have them brought together so as to be available for those within the industry upon whom rests the burden of charting the course of automotive activities.

Our Industry Today—

August Output Is Expected to Surpass July Figure but Present Indications Do Not Point to an Excess Over a Year Ago

NEW YORK, Aug. 4—Automobile producers are entering August with somewhat increased manufacturing programs, but with little likelihood at the outset that the 345,303 production figure of a year ago will be reached. The movement forward in operating schedules will continue to hinge on retail demand, which has shown some improvement and the probability of more active purchasing in September.

Manufacturers believe that the farmer from now on will be a more important element in sales, due to higher prices for his products and the more cheerful feeling he entertains as a result. His appearance in the market as an appreciable buying factor will be reflected strongly in increased schedules in passenger car and truck producing plants. Already he has shown signs of entering the market for tractors.

Should August follow the production curve of the two preceding years it will show a greater output than in July. This normal condition is due to the longer working month, the resumption of activities after the semi-annual inventory taking and a somewhat better market in September, for which the industry must prepare itself in August.

Truck Output Reduced

Although conditions are somewhat different this year from last, it would not be surprising to see the upward trend in production continuing throughout the month. There still prevails much business uncertainty which was felt in the slack retail demand in many sections of the country during July. This uncertainty which has prevailed for the last few months has shown itself in the gradually reduced truck output, the greater portion of which is absorbed by commercial centers.

Truck production reached its highest point this year in April with a total of 36,156. In May it dropped to 33,411 and in June was reported at 27,863, the low figure for the year. It is not likely that there will be a pick up in this branch of the industry until the business outlook is more clearly defined or unless the farmer demand materializes in the meantime.

The same factor of uncertainty has acted in producing a spotty condition in retail demand for passenger cars. Distributing areas here and there report a better July than a year ago. With the improvement over June reported in many territories there is a feeling that a further stepping up will come in August, causing a complete removal of such stocks as may be on hand.

Parts makers express themselves as optimistic over the prospects for the remaining months of the year.

Holding Production to Dealers' Needs

Definite Manufacturing Schedules Will Be Resumed in September, Detroit Says

DETROIT, Aug. 4—Practically all of the companies in this district which are planning changes in lines for fall, winter and next spring business will complete their plans and make their announcements during August. This will clear the general manufacturing situation to a larger extent and make certain of resumption of definite manufacturing schedules in most plants early in September.

August operations, though showing an improvement over July, will continue at reduced pace taking the industry as a whole, though some plants are operating on a scale approaching the peak months of the early year. There is a tendency, however, to keep manufacturing down entirely to the actual basis of car movement at retail.

In this the financial angle has an important bearing. A large part of the money ordinarily available for placing cars on the dealer's salesroom floor or in his hands is now out on cars that have been sold at retail and on which payments are being made. Until the finance companies get in a considerable part of this money now being paid on deferred payment plans there will be no great amount of money available for dealers stocking.

The banks of the country are unwilling to place any more money with automobile finance companies at this time owing to the feeling that there now is sufficient money out on automobile collateral. This condition is affecting some manufacturing companies more than others, according to the strength of the financial connections, and the strength of their dealers credit, but all companies are feeling it to some extent. The natural effect of this is to curb production generally so that practically all cars that are being shipped are against actual orders in the dealers' hands. Factories, too, are holding back on production to permit dealers to whip their establishments into good shape for business in the coming fall.

Conditions throughout the country are not right for large business and sales that are being made at retail now are on terms favorable to the dealer. Any large volume of turnover could only be accomplished by excessive allowances in most cases and the thought is to avoid this. Buying in September and through the fall will be along reasonable lines.

The Week in the Industry

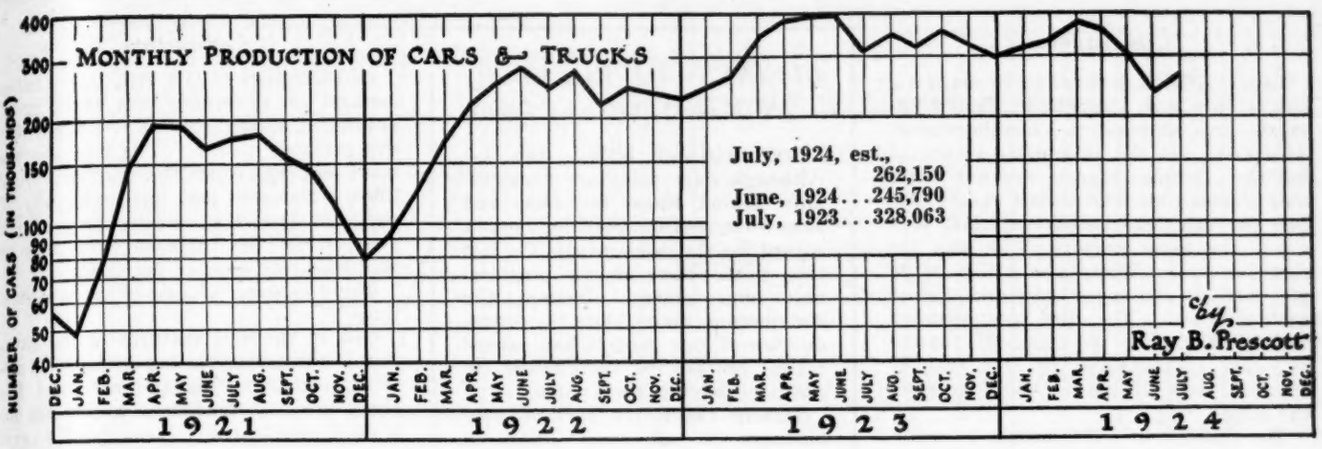
A survey made by the Class Journal Co. representatives estimates July production at approximately 262,150 cars and trucks, about 7 per cent over June. This advance is in keeping with expectations and represents a normal increase in output. Production in August should be slightly higher than July but the industry is not expecting the big totals that marked the same period last year. Nineteen twenty-three was an exceptional year and should not be used as a standard of comparison.

Charles W. Nash has named D. M. Averill as vice president and general manager of Ajax Motors, recently formed as a Nash subsidiary. This marks a significant step in the development of this new unit and demonstrates that while Mr. Nash is not yet ready to take the public entirely into his confidence he is losing no time in whipping the Ajax proposition into shape.

The McKenna duties on motor cars have been officially removed by Great Britain, an important epoch in the export world. American makers have anticipated the lifting of the ban and are well prepared to make a fight for more English business. But it should not be forgotten that the United States will have Continental competition that will be formidable and one hardly can look for an answer to the question as to whether or not America's opportunities have been improved by the legislation much before spring.

Sponsored by the National Automobile Chamber of Commerce, every new owner hereafter will get with his car a carefully written booklet instructing him on the rules of the road, safety principles and how to get the most out of his purchase. This is a sensible step and should do much in making the highways safer for their users.

July Output Estimated at 262,150



Mounts 7 Per Cent Above June Figure

Advances Come Gradually in Response to Growing Demand from Retail Trade

DETROIT, Aug. 6—As closely as can be figured from an unofficial survey made by representatives of the Class Journal Co., production of cars and trucks during the month of July ran from 7 to 8 per cent ahead of June. On this basis the output for the past month should approximate 262,150. Final figures cannot be obtained until the N. A. C. C. completes its estimate next week.

The results of the survey bear out the predictions of the prophets who were looking for increased outputs following the period of vacations and inventory taking. There was nothing spasmodic about the increase, the advance in production coming gradually and in response to dealer demands. Purposely the builders marked time until the dealers reduced stocks.

With the advent of new models there has been increased activity among the manufacturers, which, perhaps, helps account for the advance of something like 17,150 in July, although there are those who declare that some of the popular makes have been speeded up to meet the quickened demand.

Government Puts June Production at 245,790

WASHINGTON, July 28—The Department of Commerce's monthly report on motor vehicles output shows a total of 245,790 for June, which is slightly under the estimate of 249,868 made by the National Automobile Chamber of Commerce. Production of passenger cars is given at 217,927, which is comparable with the last quarter of 1922, when the figures ran 217,582 for October, 215,362 for November and 208,016 for December.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, Aug. 6—Business sentiment continues to improve. The reparation agreement among the Allies at London, continued strength in agricultural commodity prices, and better crop prospects are among the factors tending to promote confidence.

Buying on an increased scale is noted in many lines, and industrial activity, while still curtailed, has responded in some cases to the growth in demand. Operations in iron and steel are reported to have gained for the third consecutive week.

Car loadings in the week ended July 19 numbered 930,284, comparing with 910,415 in the preceding week and 1,029,429 in the corresponding period last year.

Production of crude petroleum in the week ended July 26 averaged 1,987,700 barrels a day, as against 1,977,500 barrels in the preceding week and 2,274,400 in the similar period last year.

Business failures reported by Bradstreet's for July number 1533, marking a decline of 1.7 per cent from June, but an increase of 9 per cent over July a year ago.

Bank debits to individual accounts reported by the Federal Reserve Board for the week ended July 30 amounted to $9,340,000,000, showing a decline of 0.8 per cent from the total for the preceding week but an increase of 7.3 per cent over that for the corresponding week last year.

New Month Promises Increase in Output

Chicago Territory Expects Even Better Automotive Production by September 1

CHICAGO, Aug. 4—There is an easier feeling in the industry of this section as a new month, which is expected to mark an upward turning in passenger car production, is entered upon. August will not record what could be regarded as a large increase in passenger car output, but the indications at this time are that the increase will be more than noticeable when the final count is made.

Factories that have been operating on schedules ranging from below normal to very low, as well as one or two that have substantially closed down for a while, will be factors in the month's activities. These resumptions should, of themselves, help swell the month's totals.

By the first of September dealers for the most part should have their holdover stocks well liquidated and be in a position to handle larger takings of 1925 models. September should mark another step in the rising trend of manufacturing.

Cleveland Reports Only 30-Day Stocks

CLEVELAND, Aug. 4—Motor vehicle manufacturers and tire and accessory men throughout this territory have practically issued the same statement regarding the present condition of the automobile industry. They agree that the distributors over the country have not in excess of 30 days' supply of goods on hand.

This condition, the industry here generally believes, carries out the prediction of a few weeks ago that the late summer and early fall would see a considerable increase in sale of all lines associated with the motor car industry.

SALES OUTLOOK BETTER FOR AUGUST

Los Angeles

LOS ANGELES, Aug. 4—In many respects July was a month of disappointment in automotive merchandising. There was not the anticipated return of buying. Definite reports are not available at this time, but dealers report that new car sales ran behind July last year about the same proportion as was the case for June. There was a loss of 30 per cent on passenger cars and 25 per cent on trucks. The June recapitulation showed that out of 66 makes of passenger cars as measured by last year 37 showed losses, 15 gained and four were the same.

The number of 1924 models in warehouses remains large.

There is the usual increased trade in allowance in used cars in order to induce the purchaser to accept 1924 models. The used car demand is unexpectedly strong. Dealers account for this by a falling off in buying power and the fact there is such a large number of exceptionally good used cars on the market.

Milwaukee

MILWAUKEE, Aug. 4—Prospects for passenger car business during August are materially brighter than for July, particularly in view of the fact that the bulk of new models and type will have been disclosed before long.

It has been demonstrated again this year that anticipation of new cars has retarded retail sales. Those makers who came out about July 1 with new models had no difficulty improving their sales in July in comparison with June or May. Others as a rule experienced some falling off, especially in cases where a dealer was unable or had orders not to admit that his factory was coming out with something new.

A few leaders in the local field succeeded in surpassing their sales volume of June, but it may be said that the majority note a falling off. At the close of July the general report was that stocks of new cars were in a satisfactory condition. Used car stocks are low.

Cincinnati

CINCINNATI, Aug. 4—Dealers in automobiles, trucks and accessories do not find their business as dull as do dealers in other lines of trade. Sellers of higher price cars report a good July, and in some cases there has been an increase over the previous month. Medium price car dealers report that their July business was satisfactory and look for an increase in August. There has been some decrease in sales of low price cars, due to unemployment of salaried men and wage earners. Moreover, some who are still employed are deferring purchases until business conditions are more stable.

BUSINESS IMPROVING IN FARMING SECTION

DES MOINES, IOWA, Aug. 5—Although July sales are considerably behind those for June and somewhat smaller than last year's record for the same month, the last two weeks have shown considerable improvement. Dealers and distributors claim that the introduction of new models has caused many prospective purchasers to postpone buying for a time.

During the latter part of July business in all lines improved slightly. There has been more buying on the part of the farmer, due, mostly, to the better prospects for a good crop and the better market prices for produce. While most of the surplus corn and grain of Iowa was marketed long ago, and the farmer has little to sell at the improved prices, the better market has helped to create an optimistic feeling with the consequent betterment of trade.

With prices of wheat, corn and other farm products going up, all are certain that prosperity soon will return to the rural districts and increase the sales in those sections.

Cleveland

CLEVELAND, Aug. 4—Although there are exceptions in cases of dealers handling certain popular priced cars, business as a whole in July in this city was not up to June.

A survey made by the Cleveland Automobile Manufacturers and Dealers Association, Herbert Buckman, manager, disclosed that dealers' stocks on hand at this time represent about one month's turnover.

The average dealer here appears to be in about the same condition with respect to used cars. Sales of used cars during July fell below June, although the difference is probably slight.

Prospects here are regarded as favorable for fall business.

Buffalo

BUFFALO, Aug. 4—Retail automobile selling of new cars fell off about 30 per cent here during July, as compared with the corresponding month of 1923.

Generally speaking, the used car business suffered less than new car merchandising, the demand for used cars having been about normal during the month.

Dealers are optimistic concerning fall and winter business.

Columbus

COLUMBUS, OHIO, Aug. 4—A better demand for passenger cars of all prices developed during July as compared with the previous month. The increase was most noticeable in the medium priced lines. Demand was approximately 25 per cent less than during July of last year, while the increase over June of this year was about 5 per cent.

There is some accumulation in certain lines.

One of the best features of the situation is the better feeling in farming sections, owing to higher grain and live stock prices. Conditions are better for a good steady trade throughout August and September and possibly later in the year. Used cars are selling fairly well, but stocks are rather heavy.

Chicago

CHICAGO, Aug. 5—While conditions are spotty in the Chicago retail trade the beginning of the new month finds better business among a number of the local dealers and a more optimistic atmosphere generally than was noted in the early part of July.

On the whole it can be said that there has been an improvement, a turn for the better being especially noticeable within the last week or two. In some of the exceptional cases this improvement amounts to from 40 to 50 per cent as compared with the average running of June and July.

Philadelphia

PHILADELPHIA, Aug. 4—July sales of passenger cars improved considerably over those in June. While in a number of cases stocks are somewhat heavier than is usual at this season, in no case are they regarded as excessive.

Dealers representing the eight leading manufacturers who have announced new models thus far are accepting them readily, their chief anxiety being to dispose of the remainder of last year's models before their stock becomes too heavy to move quickly.

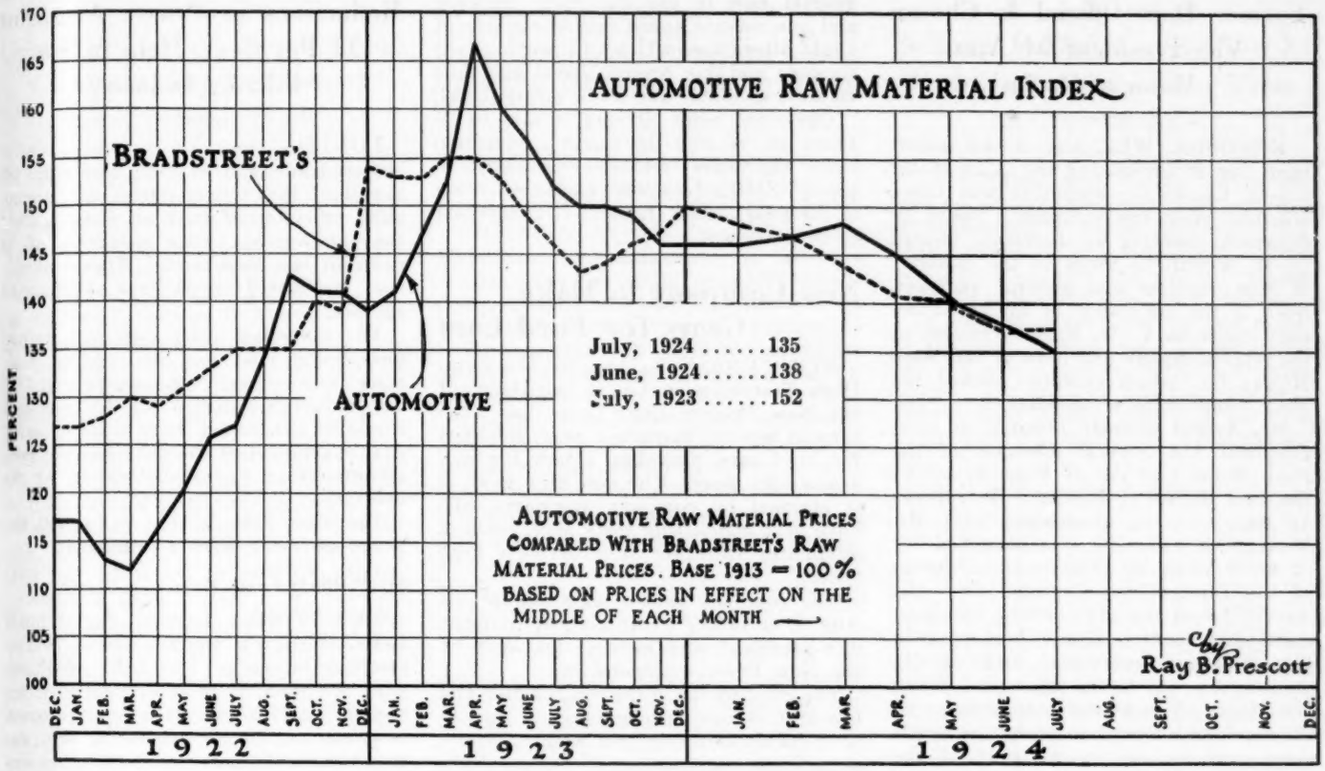
Boston

BOSTON, Aug. 5—A better feeling exists among automobile distributors here as the result of a sudden impetus in general business. Textile mills in New Bedford, Fall River, Lowell and Lawrence have shown a revival of operations. So has the shoe trade at Brockton.

Orders are coming in to Boston from outside dealers more steadily. Some of the dealers and distributors have 1924 cars still on hand. There are plenty of used cars in the territory.

(*Conditions in other cities on page* 299)

MATERIAL COSTS CONTINUE DOWNWARD



Cities Report July Business as Exceeding That of June

Baltimore

BALTIMORE, Aug. 4—Although there was a slump in the new car business in Baltimore in the early part of July which was felt by many dealers, there has been a recovery, and a satisfactory volume of business was done during the last of the month. It is reported that practically all dealers except those handling cars in the high-price class, have reached the volume of business done during the corresponding period of last year, and that some of the dealers in medium-priced cars have exceeded it.

The used car business also has been satisfactory, and most of the dealers have fewer of these on hand than usual.

Dealers for the most part are not overstocked with either new or used cars. The outlook is generally regarded as satisfactory by the dealers.

Denver

DENVER, Aug. 4—Denver dealers report improved business in July over June and the preceding months of this year. Complaints of spottiness are occasional but rare. Renewed confidence in the agricultural and industrial situation has encouraged more liberal expenditures. Improvement in business has not quite brought it up to the level of last year at this season, but this has almost been reached, and the outlook for continued improvement is flattering.

Labor conditions are satisfactory and show little unemployment, so that skilled workmen are able to buy medium and low priced cars. Crop conditions are excellent with heavy wheat and corn plantings, while advancing livestock prices have been large. As a result rural sales are good.

Seattle

SEATTLE, Aug. 4—Automobile distributors in Seattle report business as "fair to middling," with July slightly below July of last year. The first six months of the year finds the majority of standard make cars about equaling the 1923 sales. Dealers report that there is sufficient money in circulation to buy cars in spite of the general slowing up in common with sales in other parts of the country. Purchases have been made by dealers for immediate requirements rather than carrying large stocks.

One brighter factor is the indication that the farmers are going to be in a mood to buy more cars this fall and inquiries from the agricultural regions are more marked. Practically all branches of agriculture in this State are going to net more on 1924 products than last year.

Another big key industry, lumber, will also be brighter in 30 days.

Birmingham

BIRMINGHAM, ALA., Aug. 4—Dealers are anticipating their best sales for 1924 in August, September and October of this year. Sales have been slow but stocks have been kept down so that dealers are not overloaded.

The Ford dealers have been overstocked to a large extent in various parts of Alabama, but their stocks have been moving well in the last few days and they are beginning to see daylight now.

Dealers believe that business will improve with the coming of the big crops.

The used car market has felt a decided slump in the last 30 days. This has been due to the uncertainty in business conditions during July.

St. Louis

ST. LOUIS, Aug. 4—There was a noticeable increase in the sales of automobiles here last month. Some impetus was added to the buying movement by the introduction of new models in several lines.

Many buyers who were "waiting for the new models to come out" have had their last objection to buying removed and have closed deals for the cars they wanted.

The used car situation is satisfactory.

(*Conditions in other cities on page* 308)

Averill Will Manage New Nash Subsidiary

Former Dort Official Is Chosen Vice-President of Ajax Motor of Racine

KENOSHA, WIS., Aug. 5—An important step in organizing the Ajax Motor Co. of Racine for operation was taken Monday when the company's board of directors, meeting in Kenosha, elected D. M. Averill to serve in the capacity of vice-president and general manager. Such is the substance of an announcement made by C. W. Nash, president of the Ajax company and head of the Nash Motors Co., which recently formed the Ajax company as a subsidiary.

Mr. Averill recently resigned as vice-president and general manager of the Dort Motor Car Co. of Flint to accept the new duties in Racine. He returns by this move to association with Mr. Nash, with whom he was identified for 12 years when Mr. Nash was in charge of the Durant-Dort Carriage Co. Mr. Averill joined the old carriage company soon after leaving school, beginning in the shipping department and rapidly working his way to the top ranks. When Mr. Nash resigned the management of the carriage company to accept the presidency and general management of the Buick Motor Car Co., Mr. Averill stepped into the vacated office.

Later he took charge of manufacturing operations of the Chevrolet company's Detroit plant, and subsequently assisted Mr. Dort in organizing the Dort Motor Car Co., serving that organization as vice-president and general manager until he resigned to take executive charge of the new Ajax company.

Alexander Dow Develops New Automatic Gearset

NEW YORK Aug. 7—An automatic gearset, employing what is described as "a fundamental law of epicyclic gearing never before employed" and is said to utilize the reversal of torque which occurs when the throttle is closed while the car is in motion to effect gear changes, has been developed under supervision of Alexander Dow by the American Car & Foundry Co.

Rights to this gearset will be acquired by a new corporation, known as the Dow Transmission Corp. recently organized under New York State laws, and owned by Mr. Dow and the American Car & Foundry Co.

Engineering details concerning the gearset and its control mechanism have not as yet been released, but it is understood that the device has undergone successful service tests as well as laboratory tests conducted at the Massachusetts Institute of Technology.

An experimental installation of the gearset on a standard passenger car is reported to include a lever for shifting from forward to reverse, but other gear changes are said to be accomplshed by the reversal of torque which accompanies a closing of the throttle when the foot is lifted from the accelerator pedal. The gearset now in use has three forward and one reverse speed and is capable of slight alterations which will provide four forward and one reverse speed and thus make it available for truck installations.

Operation while driving is said to be silent as is also the shifting operation since the gears remain constantly in mesh. Shifting as well as the selection of the gears to be engaged is understood to be automatic.

New Company to Make Gears for Ford Cars

SYRACUSE, N. Y., Aug. 5—The Twin-High Transmission Co., a subsidiary of the New Process Gear Corp., has been formed here to market a gear, intended for Ford cars, providing a new low and a new high gear. The new high gear, it is claimed by company engineers who have been conducting tests here, entirely eliminates vibration at moderately high speeds.

The company is to begin operations Aug. 1, according to Anthony Henninger, vice-president and general manager of the New Process corporation.

The chief factor in the construction and use of this new transmission is said to be unusual quietness, light weight, safety, ruggedness, elimination of countershaft, flexibility and economy of fuel and of brake bands. The principle of the gear, Mr. Henninger says, can be applied to any car.

The output of the Syracuse factory for the present will be confined to the manufacture of transmissions for Ford cars only, Mr. Henninger says.

According to company officials, installation of the new transmission does not interfere with the present planetary gearing system in Fords. It is installed back of the regular gears and both are used. The gears really are supplementary to present ones.

Essex Sixes Made So Far This Year Exceed 52,000

DETROIT, Aug. 5 — Production of Essex sixes so far this year is in excess of 52,000, the Hudson Motor Car Co. reports, a total which is now 10,000 ahead of the total production of Essex fours in 1923. The Essex output last year was one car short of 42,000. Eighty per cent or more of this business has been in the coach model, the company reports.

A statement by the company summarizing conditions generally, says:

Business affairs in general are encouraging. The whole business structure is sounder with better crop prices, more men employed and with improved markets for all goods and labor. We feel that we are amply justified in expecting a better second half of the year than we had the first. Business rests on confidence and sentiment is now more optimistic than earlier in the year.

Britain Lifts Duty; Sales Remain Steady

Reductions in Prices, Averaging 11 Per Cent, Help in Stabilizing Industry

LONDON, Aug. 5 (*by cable*)—Calculations made by the trade here since removal of the import duties on automobiles, officially effective on Aug. 1, show that an average price reduction of 11 per cent has been made. These calculations are based on 95 lines of imported chassis.

The numerous price cuts and refund guarantees made on the leading lines since May, when it was announced that the McKenna duties at 33 1/3 per cent would be eliminated, have steadied sales. Actual removal of the duty has not been accompanied by any dislocation of the industry.

The view here is that sales will improve as prices become stabilized.

Sir William Letts Here

NEW YORK, Aug. 4—Sir William Letts, managing director of the Willys-Overland Crossley Co., Ltd., of Stockport, England, is in this country on his annual visit to the plant of the parent company at Toledo, where he will discuss Overland plans for the coming season with John N. Willys.

The effects of the removal of the McKenna duties on Aug. 1 will not be known until next spring, in the opinion of Sir William. American cars are well established in Europe, and the lifting of the duties finds them in competition with Continental makers, who also are benefited by the abolishment of the tax and who likewise have the additional benefit of difference in money rates.

Business prospects are good and will improve materially if the European situation clears up, which Sir William expects it will. So far as the British Overland is concerned, prospects are bright. Sales in Great Britain alone have increased 30 per cent over last year, while the export division, which takes in the Scandinavian countries, Holland and India, is running from 25 to 30 per cent better than last year.

The manufacture of British Overlands will continue, of course, while Sir William declares that the Willys-Knight is coming strong in his territory. His plant is running at about 35 to 40 cars a day in the way of output, and the English concern has just put into production an Overland one-ton truck, which is meeting with success.

BALLOONS ON MOTORCYCLES

AKRON, Aug. 4 — Genuine balloon tires for use on motorcycles are now being produced by the Goodyear Tire & Rubber Co. The size is 27x3.85, a change over being required from regular 22 and 21 in. wheels to 20 in. wheels.

Ford Makes Changes in Type "T" Engine

Lighter Piston and New Style of Camshaft Used—Tractor Improvements Made

DETROIT, Aug. 4—Minor changes in the pistons and camshaft of the Model T engine have been announced by the Ford Motor Co. The new piston, known as the Light design, is being used in both production and service. It differs from the old type by having thinner side walls and smaller bosses and holes for piston pin bushings. It can be distinguished from the former part by a small flange extending around the inside bottom edge of the skirt.

The change in design reduces the weight of the piston to about 1¾ lb. To meet service requirements the piston is furnished in standard and four oversizes as follows: 0.0025, 0.005, 0.031, 0.033 in. In order to provide service, dealers will have to carry the old and new type pistons and piston pin bushings. This is made necessary by the fact that, where the replacement of but one piston is necessary, it will be necessary to supply the old type to maintain proper balance. Where a new set of pistons is installed, the light design parts may be used.

Changes in Camshaft

On the camshaft, the length of the No. 1 exhaust cam has been increased from ⅞ to 1 1/16 in. and the front camshaft bearing has been reduced in proportion. The new bearing differs from the old in that the notch and 30 deg. chamfer on the rear end of the latter has been eliminated.

Due to the decreased distance between No. 1 cam and the flange on the new type shaft, when selling a camshaft front bearing, it will be necessary to ascertain whether the car in which it is to be installed is equipped with the old or new type camshaft. The old style camshaft will be discontinued as soon as present service stocks are exhausted.

A new design of dust and waterproof coil box and cover has been adopted as regular equipment on the Fordson tractor. Both bottom and back of the new box are made of reinforced heavy rubber, while all joints have been made tight by means of felt packing and the use of a cork gasket between the cover and box. Improved type spring latches hold the cover tightly in place. New type hold-down springs are provided in the coil box cover which hold the coil tightly against the box contacts. To prevent water reaching the terminals, a trough is located at the back of the coil box cover.

RICKENBACKER AHEAD OF 1923

DETROIT, Aug. 4—Orders for Rickenbacker vertical eights since the announcement of this new model are sufficient to guarantee capacity production on both the eight and six models through to Oct. 1, the company reports. The company also states that business in the first six months of the year exceeded the same period in 1923 by 13 per cent. It is expected that this rate of increase will be maintained during the final six months of the year.

Yellow Will Manufacture "Drive-It-Yourself" Cab

CHICAGO, Aug. 4—The Yellow Cab Manufacturing Co. is preparing for production of a "Drive-It-Yourself" vehicle designed especially for the purposes of "Drive-It-Yourself" operating companies.

The company will begin the manufacture of this new unit within the next 60 or 90 days.

Complete specifications are not available at this time, but some of the descriptive details are announced. The car will be produced in two body designs, one open and one closed, both five-passenger. It will have a six-cylinder engine, balloon tires, 116 in. wheelbase, low center of gravity and a special transmission, so designed, it is said, that it can withstand rough treatment by a novice.

It is said that the car will not resemble a taxicab. Since first intimations that this car would be produced, the company has received numerous inquiries from "Drive-It-Yourself" concerns. A factory executive stated that, following its established custom, the Yellow Cab Manufacturing Co. will sell this product direct to operating organizations and have no part itself in operations.

Hupp Plans New "Eight" but Will Continue "Four"

DETROIT, Aug. 4—The Hupp Motor Car Corp. will widen its field by the production of a new, bigger and higher priced car with an eight-cylinder-in-line engine which will be in addition to its present four-cylinder model.

Although the new model will not be ready for distribution prior to January, 1925, announcement is made at this time to forestall rumors that have gained considerable strength that the new eight would displace the four-cylinder line. The official announcement states, "We have no intention or thought of abandoning the market or giving up the reputation that that car has created."

The information is given out in the form of a poster signed by Charles D. Hastings, president of the company, which is now being displayed in dealer salesrooms.

CANADIAN EXPORTS IN JUNE

WASHINGTON, Aug. 4—The Automotive Division of the Bureau of Foreign and Domestic Commerce has been advised by telegraph from Ottawa that the following export shipments were made from Canada during June:

	Number	Value
Passenger cars	3,512	$1,670,864
Trucks	1,124	368,771

Dealers Displaying New Jordan "Eight"

Radiator Is Higher and Hood Is Both Higher and Longer Than in Other Models

NEW YORK, Aug. 4—The first of the new Great Jordan Line Eight models are appearing in dealer salesrooms this week. The model designation of the new line is A and the present models will be continued without any change.

In exterior appearance the new model is distinctly Jordan but the hood and radiator are of course changed to some extent. The radiator and hood are both higher than before and the hood is longer to accommodate the line eight engine.

Prices of the new line follow:

5-pass. phaeton	$2,575
2-pass. runabout	2,575
5-pass. brougham	2,875
4-pass. Victoria	2,775
5-pass. sedan	2,975

These prices are only slightly in excess of those of the current line, roughly $500 higher. While the car seems larger than before, yet the wheelbase is only 126 in., and the weight of the sedan is but 3585 lb. with complete equipment for the road.

Details of Engine

The engine has eight cylinders, in line, with a bore of 3 in. and stroke of 4¾ in. The N. A. C. C. horsepower rating is 28.8. The valves are all on one side of the engine, L-head type and a chain front end drive system is used as in previous models. Pressure lubrication is used, the crankshaft being hollow and delivering oil to the main and connecting rod bearings. The crankshaft is 2⅜ in. diameter and is supported in five bearings. The firing order is 1-6-2-5-8-3-7-4. A Lanchester vibration dampener is used at the front end of the crankshaft.

The electrical system is American Bosch, starting, lighting and ignition. The units are divided, the starter being on one side and the generator on the other. The carbureter is a Stromberg and is provided with a United engine air cleaner.

Few Changes in Other Units

In general, aside from the engine, the units of the car are of the same character and design as on previous models, but revisions of the design have been made to take care of increased weight, power and torque. The rear axle is a Timken unit with gear reduction of 4.54 to 1.

Hydraulic four-wheel brakes of the Lockheed type are standard equipment on all models as are balloon tires 6.20 on 20-in. rims.

The finish is either Crane-Simplex two-tone gray or Duco dark blue, the sport models in thistle green.

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Net of $4,030,110 Reported in Comparison with $3,542,259 in First Three Months

NEW YORK, Aug. 4—Following the declaring by the Studebaker Corp. of quarterly dividends of $1 on the common and $1.75 on the preferred, both payable Sept. 2 to stock of record Aug. 9, the financial district expressed the opinion that the showing for the second three months of the year was a good one, all things considered. The declaration represented $2.07 against $1.81 on the common in the preceding quarter and compares with $3.75 in the June period last year.

A falling off in sales in comparison with last year is shown in the corporation's financial report on its operations in the second quarter of 1924, in which period 28,152 cars were sold as against 43,680 for the same period in 1923. For the first half of this year sales totaled 57,587, compared with 81,891 in the first six months of last year.

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Net sales in the period just ended were $35,502,735, with $71,106,226 the total for the first half, in comparison with $49,370,091 in 1923's second quarter and $92,648,545 for the half year.

"Despite the generally unsatisfactory conditions of the business this year, we nearly made our full year's dividend in the first six months, the net being $3.88 per share for the common stock," says President A. R. Erskine. "We expect results for the last six months of this year to equal those of the first half."

Company's Balance Sheet

The corporation's balance sheet as of June 30 shows in the way of assets: Cash, $8,025,312, a decrease of $1,930,478 from Dec. 31, 1923; sight drafts outstanding, $2,282,338, an increase of $596,391; investments, $1,646,148, an increase of $1,211,068; net receivables, less reserves, $9,376,382, an increase of $2,459,156; inventories, $25,067,304, a decrease of $1,607,620; deferred charges, $422,454, which represents a decrease of $106,974.

With plants and property valued at $54,867,768, housing development at $1,515,941 and trade name and good will at $19,807,276, the total assets are figured at $123,010,927 in comparison with $122,424,280 the first of the year.

Among the liabilities listed are: Notes payable, $6,000,000, as against none the first of the year; accounts payable, current, $1,311,813, a decrease of $4,255,605; reserves for taxes, $3,244,586, a decrease of $72,222; reserves, dealers' discounts and deposits, $454,274, a decrease of $2,133,985; other payable reserves, $545,250, a decrease of $2,272,808, making a total of $11,555,924 in comparison with $14,290,546 on Dec. 31.

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Nearly 9 per cent report that their business was 75 to 80 per cent trading. Only 6.53 per cent had a trading business of 80 to 85 per cent of sales and 11.41 per cent found that 85 to 90 per cent were influenced by trades. A number of dealers, in the 90-100 per cent class, representing 11.28 per cent of those reporting, declared that 100 per cent of their sales involved a used car.

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The earnings cover half year dividends on the prior preferred stock, the management stock, that of the old 7 per cent preferred stock and leaves slightly more than 25 cents a share on the common stock, according to brokers' tabulations here.

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The period's earnings are $55,412,054 worth of business done compare with net operating profits of $6,514,318 on sales amounting to $55,439,631, reported during the first half of 1923 and with net profit after all charges of $5,865,848 out of operating profits of $12,078,730 on sales of $106,026,109 reported for the entire year of 1923. The company's business and profits are, therefore, almost identical with those for the past year.

Current assets, which show a relation of 11.3 to one, according to President G. M. Stadelman's report, are put at $55,905,149, compared with $56,584,789 at the end of 1923, while current liabilities, which at the end of last year amounted to $7,612,707, are now reported at $4,828,288.

Inventories which at the end of 1923 amounted to $28,355,175 have been reduced approximately $7,000,000. Funded debt of the company has been reduced, according to the new statement, to $49,000,000, as compared with $51,250,000 as of Dec. 31, 1923. The new surplus account is $15,369,256, as compared with $11,786,136.

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The size of this item, incidentally recalls the fact that the present management of the company started with Goodyear slightly over three years ago, without any surplus whatsoever.

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According to the books of the company, its assets are approximately $2,000,000, including an item of $768,000, which is given as the value of the company's holdings in the Charlevoix Realty Corp. This latter company is a separate corporation, holding the real estate and plant, the plant being the former Liberty plant which was sold at receiver's sale last fall. The assets are listed on the basis of a going concern. Liabilities are listed at $827,748 and cover only direct liabilities.

The company as operated since taking over the Liberty plant has manufactured only the Columbia car, though some Liberty's were made from former stocks and parts bought at the receiver sale. The service rights on the Liberty has been sold to the General Parts Co. of Flint.

Announcement of the receivership was expected in the industry owing to the slow-down in general business. The naming of Lon R. Smith early this year as president to succeed J. G. Bayerline, and the effort to stimulate sales through bringing in Fred Wilson as sales manager, proved without avail, in the face of the generally difficult merchandising situation.

In taking over the plant, the receiver is making the customary audit and will take care of all car shipments and service. A report on Sept. 1 will determine whether the business is to be continued under the receivership or the property sold.

Overland Is Extending Factory Branch System

DETROIT, Aug. 6—Willys-Overland Co. has established a direct factory branch here to take over the State distribution left open by the withdrawal of Guy O. Simons. The opening of the factory branch here will be followed by the establishment of similar branches in several other cities, according to a statement by L. G. Peed, general sales manager of the company.

The other points which, according to Mr. Peed, will be changed over to the factory branch basis are Des Moines, Pittsburgh, Louisville, Wheeling, W. Va., and Altoona, Pa. Changes from the distributor basis in these cities will become effective Aug. 31.

Commenting on the proposed changes in its distribution methods at the several points named, Mr. Peed said:

"Our plan to operate a direct factory branch in Detroit is but the natural evolution of the methods of volume distribution. Believing that in these days of intensive competition first-hand control of distribution is imperative, Willys-Overland is widening its field of branch-house operations."

Steadily Increasing Market Throughout Middle West Is Expected for Balance of This Year

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BETTER business through the balance of the year is forecast by present indications, says O. C. Hutchinson, general sales manager of Hupp Motor Car Corp., though it is not to be expected that sales will equal the 4,000,000 figure set up in 1923.

The industry will not have another four million year for some time to come in Mr. Hutchinson's opinion, basing this upon the thought that the normal four million sales year is still some time in the future, and that the business of last year was disproportionate to the actual annual market because of undersold conditions in the several years preceding.

For the balance of this year he looks for a steadily increasing market from the middle western districts, with a return of good buying conditions in the eastern and industrial sections following the usual vacation periods. Orders are beginning to come in from Nebraska, Iowa and other middle western farm states, he declares, and the outlook in those states as expressed by dealers is that generally improved markets may be expected.

Reviewing the business of the first half of the year, Mr. Hutchinson said that there was no question but that unseasonable weather conditions and the political situation were largely to blame for the failure of sales to develop in the number anticipated. General business depression followed in the wake of these weakening the market for automotive products. This depression is now being dissipated rapidly with a promise of general activity in all lines.

Citing the case of his own company specifically, Mr. Hutchinson said there are no longer any stocks of new cars in dealer hands and that shipments now going forward from the factory were going practically direct into the hands of owners. Orders are beginning to come in by telegraph indicating the urgency of shipments.

The factory at the present time is making no effort to move cars to dealers, he said, and in fact would prefer to cease operations temporarily than to maintain them at the expense of merely passing cars on to dealer sales rooms. Business coming in is for cars which dealers have to have to meet immediate business and that there is enough of this to keep the factory operating at a seasonal pace indicates that business is holding up well.

An analysis of sales in the first six months shows that 27 per cent of cars delivered at retail were clean deals in which no trade-in was involved, a figure that would indicate that dealers were far from being badly pushed to move new cars, said Mr. Hutchinson, and also clearly indicating that there is much business still to be obtained without worry as to disposal of used cars.

Kulick Reaches Coast in 10 Millionth Ford

SAN FRANCISCO, Aug. 4—Frank Kulick, driving the Ten-Millionth Ford, completed his transcontinental journey over the Lincoln Highway July 29. Starting from New York June 16, Kulick made the trip of nearly 4000 miles with but one minor adjustment and with no mechanical difficulty of any nature, he reports.

From here the car has been routed up the Pacific Coast to Portland and Seattle.

Kendell Moves Equipment of Its Fort Wayne Plant

DETROIT, Aug. 6—The Kendell Co. of America, which has taken over the Kendell Motor Products Co. of Fort Wayne, Ind., has moved all equipment and material to this city, where it will continue the manufacture of the Kendell piston ring, the production schedule calling for 14,000 rings daily.

A sales organization is now in effect in Indiana, Kentucky, West Virginia, Virginia, District of Columbia, North Carolina, Arizona, New York and Tennessee, each State having one or more associate or affiliated companies to handle the distribution. In addition to this the sales force will be increased to 150 men to handle the rest of the national business, and an export office will be established in New York City.

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MEN OF THE INDUSTRY

F. E. Moskovics Resigns

F. E. Moskovics has resigned as vice-president of the Franklin Automobile Co., owing, it is understood, to differences with H. H. Franklin in regard to sales policy. Mr. Moskovics will continue to manage the affairs of the Stevenson Gear Co. of Indianapolis for which he was appointed last November. He is living at Cazenovia, N. Y.

Splitdorf Promotes Kelley

E. A. Kelley has been advanced from the position of factory representative at Detroit to that of director of branches by the Splitdorf Electrical Co. Mr. Kelley will have charge of all Splitdorf branch and distributor sales and service, with headquarters at Newark.

King Joins Wayne Tool

T. H. King has resigned as sales manager of the Landis Tool Co. to become treasurer and general manager of the Wayne Tool Co. of Waynesboro, Pa., maker of small tools and automotive equipment. He will assume his new duties Sept. 1. Mr. King was actively connected with the Landis company for 18 years, becoming sales manager 12 years ago. Previous to the Landis connection he was with the B. F. Sturtevant Co. of Boston, and his early training in tool manufacturing was acquired at the L. S. Starrett Co., Athol, Mass.

Cunnington Assumes Charge

Henry M. Cunnington, formerly on the editorial staff of *Electrical World*, a McGraw-Hill publication, has assumed charge of publication advertising and sales promotion literature issued by the Robert Bosch Magneto Co., Inc. Mr. Cunnington has been associated with the Robert Bosch organization since May.

Treanor District Manager

T. R. Treanor, formerly with the Butler Kwiklift Corp., has been named district manager for the Balcrank bumper by the Cincinnati Ball Crank Co. He will cover western New York.

Makers of Spotlights Organize Association

LOS ANGELES, Aug. 6—The Spotlight Manufacturers' Association has been formed here by the Clymer Manufacturing Co., Rockford, Ill.; Darsie Manufacturing Co., Los Angeles; Fyrac Manufacturing Co., Rockford, Ill.; Kay Bee Manufacturing Co., Los Angeles and the S & M Lamp Co., Los Angeles.

Ted White of the Kay Bee company has been chosen chairman; Jesse F. Brown, S. & M., secretary; James A. Darsie, Darsie, treasurer and W. A. Brockway, Fyrac and Clymer, field engineer.

The purpose of the association is to further interest in spotlights by teaching the importance of their use for driving and as a safety factor; also to cooperate with the different States in seeing that spotlights are so made that they will comply with the legal regulations.

A consulting illuminating engineer will be employed to lecture to dealer organizations, headlight adjusting stations and traffic officers' meetings.

Mack Netted $2,020,309 During Second Quarter

NEW YORK, Aug. 7—Mack Trucks, Inc., for the second quarter reports net profits of $2,020,309, after the usual deductions as compared with $1,430,307 in the preceding quarter. This is equivalent to $6.14 a share earned on the 283,109 shares of common, after allowing for dividends on the first and second preferred stocks, as against $7.89 a share in the second quarter of 1923.

In the first half the company earned $3,450,617 as compared with $4,044,476 in the first half of the previous year.

Assets show $4,145,989 in cash, $9,443,894 in receivables and $16,433,854 in inventories as against $5,002,247, $7,693,738 and $14,733,606 respectively in the same period last year.

Moon Earned $401,240 in First Half of Year

NEW YORK, Aug. 6—Earnings of the Moon Motor Car Co. of St. Louis for the first half of this year were slightly less than in the corresponding period of 1923—$401,240 as against $419,400, equivalent to $2.23 a share on the 180,000 shares of no par capital stock outstanding. The company states, however, that, judging by present business conditions, the third quarter will be the best of the year.

In the first half net sales totaled $5,375,192, the operating profit being $391,146, with miscellaneous earnings of $72,715. Out of the net earnings of $463,861 comes $62,621 for taxes.

Automobile Fatalities Numbered 680 in June

NEW YORK, Aug. 4—The Traffic Planning and Safety Committee of the National Automobile Chamber of Commerce reports 680 automobile fatalities in June, while the traffic toll for the first six months of this year was approximately 2918. This estimate is based on reports from 217 daily newspapers sent to the committee.

GASOLINE NEAR LOWEST PRICE

NEW YORK, Aug. 2—The average tank-wagon price of gasoline in 30 different cities is 15.6 cents a gallon, and about 2½ cents below the price of five months ago. This compares with the 12.7 cents a gallon low and of 21 cents high last year.

Each New Purchaser to Get Safety Book

Circulation of N. A. C. C. Publication Is Expected to Reach 2,000,000 Annually

NEW YORK, Aug. 4—Educating the new owner is the most recent mission undertaken by the National Automobile Chamber of Commerce through its Traffic Planning and Safety Committee and each of the purchasers of the 1925 crop will, it is hoped, find tucked away in the pocket of his new motor vehicle a booklet, "Getting the Most from Your Car," edited and published by the committee of which George M. Graham is chairman and John C. Long is secretary.

The Chamber expects all of its members to buy sufficient numbers of these booklets to enable them to give one to each of their customers, which ought to bring the circulation up to approximately 2,000,000 annually. Already one maker, the Chandler Motor Car Co. of Cleveland, has decided to distribute the booklets as suggested and it is expected that this example will be followed by the majority of members. Each maker will buy his supply of booklets from the N. A. C. C. and each copy will carry that maker's imprint.

The chief aim of the booklet, of course, is to advance the cause of highway safety and its editorial contents have been written with this end in view. The text contains "Rules for Keeping Upkeep Down," "Common Sense in Driving," and "Touring Hints" interestingly and tersely handled. The novice cannot help but be benefited by reading.

President's Letter Quoted

President Coolidge has approved of the action of the N. A. C. C., the booklet containing as a foreword a reproduction of a letter from him.

"The National Automobile Chamber of Commerce," the President writes, "has been among the leaders in effort for safety on the highways, in connection with automobile traffic, from the time of its organization. Its work has been of distinctly practical and worth while nature, and it is a pleasure to know that this booklet of useful information and suggestions, looking to the advancement of safety on the highways, is shortly to be issued. I have no doubt that its circulation will be a means of greatly bettering traffic conditions."

RECEIVER FOR HOWE RUBBER

TRENTON, N. J., Aug. 4—A temporary receiver, Charles D. Roth of New Brunswick, has been appointed for the Howe Rubber Co., while George M. Griffiths of Cleveland, named as president two months ago by creditors, is working on a reorganization plan. The assets of the company are placed at $797,975, with liabalities totaling $336,672.

Truck Service Joins Continental Plants

Economies Effected Through Daily Trips Between Detroit and Muskegon Factories

DETROIT, Aug. 6—Use of trucks between its plants at Detroit and Muskegon has enabled Continental Motors Corp. to concentrate certain of its manufacturing activities at each of these plants, with consequent important economies. Daily service between the two plants is maintained by two trucks, each of which make the 200-mile trip in ten hours.

The truck service is only for transportation of the product of the specialized departments at each of the plants, which are required for general manufacturing at both plants. In all other respects each plant is a self-contained manufacturing unit. Without the truck service the company would be obliged to split up these departments.

Return loads in each case are made possible by the location of separate departments at the two plants, an ideal arrangement from a standpoint of truck operating economy, and especially good from the company viewpoint in that the departments at each plant manufacture the bulk of their output for the plant at which they are located, the smaller part going to the other plant by truck.

Each truck starts from opposite plants at 6 o'clock each night, meeting and exchanging drivers at a mid-way point, and each arriving with its shipment in time for operations at the other plant early the next day. By exchanging drivers each man is brought back to his home every day. On only four occasions in two years have the trucks failed to maintain schedules. Mail carried by the trucks is delivered at the opposite factory seven to ten hours quicker. Cost of the service as shown by company records is $8 a ton, as against $36 a ton by express, were it necessary to use this method of shipping.

Chicago Reserve Bank Find Car Stocks Down

CHICAGO, Aug. 4—Based on dollar volume sales of accessories and parts in the five States comprising the Seventh Federal Reserve District fell off considerably more than the sales of new automobiles, motorcycles and trucks during the month of June, as compared with May and with June of 1923, according to the latest survey of the Federal Reserve Bank, of Chicago. In this connection the report says:

Sales of new automobiles and motorcycles at wholesale and retail reported June 30, 1924, amounted to $141,984,333 in the five States including the Seventh Federal Reserve District. This figure is 28.0 per cent under that of May 31 and 26.9 below a year ago.

Automobile truck and wagon sales were $17,884,656, a loss of 26.1 from the preceding month and 28.9 per cent from last year.

Sales of automobile parts and accessories totaled $12,085,555, or 55.9 per cent less than those of the previous month and 41.5 per cent less than June 30, 1923. These figures are not comparable with June production or factory shipment figures.

The statement notes a further reduction in the number of cars in storage the last of June in Chicago warehouses and a considerable falling off in replacements, and says further:

The distribution of automobiles during June by 79 dealers and distributors in the Middle West was again less active than in the preceding month and year at both wholesale and retail, although retail sales declined less extensively than wholesale transactions.

A further reduction was noted in the stocks of new cars on hand June 30, as compared with the preceding month, although the year-to-year comparison shows stocks greatly in excess of June 30, 1923. Sales of used cars were below the previous month and year. The number of used cars on hand at the end of June was below that on May 31 but the volume was greater than a year ago.

Triangle Will Resume Manufacture of Trucks

DETROIT, Aug. 6—The Truck Sales & Service Co. has been formed with headquarters at Lansing, to sell and service trucks for the Triangle Truck Co., which is preparing to resume production after a layoff of several years. Only two models will be built, a ton and half and two ton and half, but the company plans special service on bodies and equipment.

Officers of the sales company are L. R. Brown, president and general manager; Alfred Burk, vice-president, and Frank Steinbower, secretary and treasurer. It is capitalized for $50,000. Mr. Brown also will manage the Triangle plant at St. Johns. Two agencies have been opened in Wisconsin, the company reports, and it is planning to build up a general dealer organization.

IRVING H. PAGE DEAD

CHICOPEE, MASS., Aug. 6—Irving H. Page, president of the Stevens-Duryea Automobile Co. in the early days of the industry, is dead, aged 65. Mr. Page also was president of the Stevens Arms & Tool Co., the Page Paper Box Co. and the National Scale Co., all of this city, as well as being director in several banks and other industries in this section.

HUPP PRICES INCREASED

DETROIT, Aug. 5—The Hupp Motor Car Corp. has increased prices $25 on all models except the four-passenger coupé. Several items of equipment and special finishes which were formerly optional are made standard under the new prices.

CHANDLER PAYS BONUS

CLEVELAND, Aug. 4—The ninth consecutive annual bonus has been paid to 1000 factory and office workers of the Chandler Motor Car Co., $200,000 being required for the purpose.

Sheet Steel Buying Lagged During July

Month Was Not Much Better Than June—Outlook, However, Has Better Hue

PITTSBURGH, Aug. 4—Reports prevalent through the East that inquiries from automobile interests furnish the feature of the Pittsburgh steel market are more a matter of sentiment than fact. The steel business in the Pittsburgh district is beginning to take on a rosier hue, due to the slight increases in buying during each of the last three weeks, but a study of the automobile end of buying indicates the enlarged purchasers from that quarter are not particularly voluminous when compared with June, which was a very poor month.

As a further indication of this statement, the last few days have witnessed another disturbance in the sheet price structure and this time it came in the automobile sheet line. It is idle to believe that in the face of increasing demand mills would cut their prices on a commodity on which they have a fairly firm quotation during the worst of the situation, yet a number of independent sheet concerns are reported to have been selling automobile sheets during the past week at a slight recession from the general market.

Foundation for Report

The foundation for the report that improvement was marked in the automobile sheet line was probably laid three weeks ago when a large parts maker suddenly entered an order for 800 tons of sheets for fenders, tanks, etc., with a large Pittsburgh interest, at a time when this steel company had been receiving reports that business of the parts makers in the automobile field was slow. Soon afterward, the general improvement in steel buying was noticed and the automobile end of the buying came in for a large share of attention.

From information gathered first hand it is permissible to say here that the total bookings during July of the independent mills of specialty sheets, which include automobile sheets, were approximately on a par with those of June, hardly a good month.

The demand for heavier steel products for the automobile industry is characterized here as fair with many aspects of improvement but with the best signs still ahead.

LEXINGTON SHOWS PROFIT

CONNERSVILLE, IND., Aug. 4—In the 14 months the Lexington Motor Co. has been operating under a receivership, it has produced and sold 814 cars, valued at $1,162,428, it is reported. Service sales for the period up to July 1 amounted to $235,619. An operating profit of $17,654 before depreciation and taxes is shown.

Tractor Production Moving Cautiously

At Same Time, Brighter Aspect Has Come with Improvement in Farmer Situation

MILWAUKEE, Aug. 5—It is rather surprising even to the most optimistic that the recent sensational advance in grain prices has been followed with almost amazing speed by a marked improvement in the demand for power farm equipment, which is steadily reducing the accumulation in makers' and distributors' hands, and if it is sustained, undoubtedly will result in an appreciable improvement in production schedules.

Checking up the results of the first half of 1923, Milwaukee and Wisconsin farm equipment manufacturers found that their business on the whole held about even with the first half of last year. At that time prospects were said to be much better for the second half of 1924, and later this hope was sharply accentuated by the upward movement in grain prices.

From Racine comes the report that the J. I. Case Threshing Machine Co. is daily making large shipments of threshers and other machinery, both to foreign and domestic markets. Several trainload shipments have been made in the last three weeks, and more are booked for the remainder of August and September.

The Townsend Tractor Co., Janesville, Wis., has resumed the manufacture of tractors, which was suspended owing to financial difficulties two years ago. It is building on the average of one 60 hp. tractor a day, and selling these mainly to road contractors and those doing custom moving. A few of the lighter 40 hp. type are being built.

It is known that the brighter aspect is not carrying away the industry into errors that caused the partial collapse of three or four years ago. Production schedules are being brought up slowly and with every consideration for the ability of the market to absorb tractors as produced.

More Men Put to Work by Industry in Toledo

TOLEDO, Aug. 5—Bottom has apparently been reached in the employment situation in Toledo and automotive plants are beginning to show evidence of increasing production schedules.

The weekly employment census made here covering 51 plants shows 13,800 employees as compared with 29,965 for the same week last year. However, there are now 896 more at work than two weeks ago and many plants are adding men.

The Willys-Overland Co. has about 4000 men at work now and is gradually building up. Electric Auto-Lite Co. has cut into its working force in the last few months but has shown some improvement lately. Bock Bearing Co. is taking a complete layoff for a short period of vacation. Champion Spark Plug Co. and several others are working practically up to normal schedule.

Of the 51 plants reporting 14 are working on reduced schedules with 6458 workers averaging 32.7 hours a week. Many of these, however, are outside the automotive trade.

Factories at Janesville Resume Following Recess

JANESVILLE, WIS., Aug. 5—After a recess of several weeks, activities have been resumed at the Janesville, Wis., works of the Chevrolet and the Fisher Body corporation. The body factory reopened July 28 and the Chevrolet plant today. While present operating forces are not up to normal, the intention is to make increases gradually as departments furnish materials in progression.

While no official statement has been made, it is believed that the prospects for a much improved market for the Chevrolet among farmers in this and other territories is partly responsible for the renewed production effort, which is based on a general need accumulated through the short period of light and suspended output.

Reo Sees Better Sales in Middle of September

DETROIT, Aug. 2—Distributors in the wheat and cotton growing sections of the country are in the best frame of mind in several years and optimistically predict a big business, the Reo Motor Car Co. reports. The corn belt is not doing so well, as untoward weather has not helped the outlook. A late fall and hot weather, however, will bring the corn crop high.

Clarence Triphagen, assistant sales manager, who has returned from the East, declared distributors in that section are increasing their allotments. This increase averages 20 per cent more than in 1923. The eastern outlook is good generally, Mr. Triphagen said, and New England is selling increased numbers of cars in the rural districts.

The company does not expect an unusual stir in the present rate of business until the middle of September. Good fall business is already in sight, however, the company says, and this will develop in volume when crops are liquidated. There will be somewhat brisker business in August, the company says, and it is operating on a full five-day week basis.

CONTINENTAL OUTPUT RISES

DETROIT, Aug. 4—Manufacturing schedules of the Continental Motors Corp. will be increased 31 per cent in August over July, according to a statement by W. R. Angell, vice-president. A general stiffening in business is being shown, said Mr. Angell, with a consequent increased interest in automobile buying in all parts of the country.

FINANCIAL NOTES

Apco Manufacturing Co., reports a 45 per cent increase in sales during a period of slack business generally. The company's statement for the first half of this year shows $548,182 sales, against $376,381 in the same period of last year. With a big battery charger business in sight for September, the company predicts a total of $1,750,000 for the full year.

Ajax Rubber Co. reports net profits of $143,517, after taxes, etc., for the first half of the year, which is equal to 33 cents a share earned on the 425,000 shares of no par value capital stock as compared with $414,720 in the first six months of 1923. Sales totaled $7,311,105, as against $8,964,371. The company states that more normal spread of sales made it possible to reduce its seasonal bank borrowings approximately 30 per cent below the peak of last year and that 70 per cent of its bank loans already has been paid off.

Spicer Manufacturing Co. and its subsidiaries showed a net profit for the first half of $703,643, after interest, charges, etc. This is equivalent to $1.57 a share as compared with $2.40 a share on the net profits of $1,030,961 in the corresponding period of 1923. Net sales totaled $6,692,001 as compared with $7,878,915 for the first half of last year.

Eaton Axle & Spring Co. reports net earnings of $135,358 for the second quarter, after all charges. This is equal to 61 cents a share earned on the 220,000 shares of no par value capital stock outstanding. Earnings for the first half equalled $1.12 a share.

Graton & Knight Manufacturing Co. will redeem $120,000 outstanding scrip dividend certificates Aug. 15. This amount was issued in payment of the dividend on the company's preferred stock Aug. 15, 1921.

Savage Arms Corp. reports net earnings of $383,968 for the second quarter, after all charges and preferred dividends.

Upward Move in Trucks Expected During Fall

DETROIT, Aug. 5—Prospects for truck business in the eastern and southeastern States are extremely bright for for the fall months, reports O. W. Hayes, president of the Republic Motor Truck Co. after a trip through that section, on which he was accompanied by E. E. Sieg, general sales manager.

Opinions by truck men, business men and bankers through this section were that sound business conditions and a generally rising movement in all lines of industry would require the use of increased numbers of commercial motor vehicles. This new business will be reflected immediately at the truck factories, Mr. Hayes declares, as dealers have been handling their business on a very conservative basis and are entering this seasonal buying period with very low stocks.

MOHAWK TO INCREASE OUTPUT

AKRON, Aug. 6—Announcement is made by the Mohawk Rubber Co. that immediate steps will be taken to increase production facilities of the factory to meet increasing demand.

Ford Plans Changing Freight Rate Policy

Proposed Action Is Due to Company's Increased Shipments of Closed Models

DETROIT, Aug. 5—Increased demand for closed cars over the last few years will result in a change in the Ford Motor Co. freight rate policy, it is expected, within the near future, the present policy being based upon the shipment of six cars a box car, a schedule that cannot be realized with increased shipments of closed cars.

This will result in a slightly higher delivery cost of cars, the rate being apportioned on the basis of five cars a car load instead of six, as at present. Much of the shipment of the past year has been on a basis of five cars a carload, but no action involving a change in the regular freight policy has been taken.

The report that Ford Motor Co. is taking most of its profit on cars through the application of its f.o.b. Detroit freight policy is dismissed as idle by those familiar with Ford business. It is possible to realize substantial profits through the freight rate policy alone, it is admitted, but the company is not in a position where its business is to be conducted on that basis.

Through the operation of its shipping policy the company is able to maintain a certain amount of control over the territories of its dealers, the freight rate in one zone keeping out competition in the next, and confining all dealers to doing business only in the zone in which their freight rates apply.

Hinkley Is Extending Dealer Representation

DETROIT, Aug. 4—Conditions in the unit replacement field are reported by B. B. Unwin, sales manager of Hinkley Motors, Inc., as showing steady improvement. The company is adding dealers in many parts of the country.

The company is specializing to a large extent in replacing engines in Ford trucks and heavy duty trucks with special Hinkley replacement engines, making it possible to renew the life of a vehicle several times before its economic use is exhausted. It is selling its engines only through dealers and will maintain this policy.

The engine replacement idea is gaining in favor with dealers as presenting a possibility for greater earnings, Mr. Unwin says, and the company is devoting the larger part of its effort in educating dealers as to methods in getting this business.

DEVELOPS RUBBER ACCELERATOR

WILMINGTON, DEL., Aug. 6—Announcement is made by E. I. du Pont Nemours & Co. of the development by its dyestuffs department of a complete variety of rubber vulcanization accelerators for use in the manufacture of high grade automobile tires. These organic chemicals are the result of three years' work by research and engineering chemists. The company also has equipped a rubber laboratory for technical service which is staffed by experienced rubber chemists.

INDUSTRIAL NOTES

Automotive Fabric Equipment Co. of Milwaukee is the style of a new corporation which has been organized to take over a business established some time ago by the members of the Gayhart Millinery Corp., Milwaukee. The principals are J. H. Gayhart, C. A. Price and H. A. Malig. It is intended to increase greatly the output of fabrics for automobiles, mechanics' garments, tool kit bags, tire covers and a general line of goods of this character.

Phil L. Johnson has purchased the business of the J. R. Nill Manufacturing Co., Indianapolis, manufacturer of rocker arms and push rod covers for Chevrolet cars. The name of Mr. Johnson's new company has not been announced as yet.

H. Ruben has sold his interest in the Arkay Sales Co. and has formed a new organization, the Rubey Sales Co., to act as direct manufacturers' representative for automotive equipment.

Gray Engineer to Visit European Manufacturers

DETROIT, Aug. 4—Rudolph Stahl, chief engineer of Gray Motor Corp., is en route to Europe on a six weeks' tour, on which he will study European engineering, with the particular view of incorporating in the Gray car developments which will make the car more adaptable for requirements in foreign countries. He will also visit European distributors of the company to get their views on improvements for their particular markets and to form closer contacts.

According to a factory statement, Gray is now shipping a larger percentage of its total output abroad than any other American automobile producer. In June this percentage was 28½ per cent, and it has been consistently high for the last two years. European business forms a large part of the company's total export trade, which, however, is also large in South America and is developing steadily in all foreign countries.

On his trip Mr. Stahl will visit all European manufacturers building low priced cars and will also visit many of the builders in the higher priced fields. He will study especially developments looking toward increased fuel economy as probably the most important factor in the sale of cars in countries other than the United States.

"ULTIMATE" PLANT SALE

NEW YORK, Aug. 4—The plant of the Vreeland Motor Co., Inc., maker of the Ultimate truck, located at Hillside, N. J., which is in bankruptcy, will be sold at auction Aug. 14 by court order.

METAL MARKETS

More liberal specifications against contracts by automotive consumers constitute the steel market's outstanding feature. Considering the more than cautious attitude of purchasing agents, the volume of this business is doubly gratifying because all of this material is obviously intended for immediate conversion. As a result the feeling that the steel industry is headed for much broader activity at an early date is becoming more and more pronounced and general.

Rumors that German steel mills have begun to compete actively in the American market for business at prices more than $5 under the lowest domestic quotations may and may not be deserving of serious consideration. Certain it is that there is little sense to the chief argument used to show these reports up as absurd. It is pointed out that the statistical record discloses that our ferrous imports fall below 1 per cent of our domestic production, and that the bulk of our imports consists of ferrous raw material, such as ore, scrap and pig iron.

Present-day world conditions have made statistics of the past a poor index for the possibilities of the present and the future. Europe is sending us brick by the millions today. A few years ago such a possibility would have been laughed at. Precedent is certainly not going to keep the Germans or other European steel-producing nations out of this market. Fear of retaliation by American steel producers in other world markets may be far more of a deterrent. English steel makers complain bitterly of the severe American competition they are facing in the Far East. The Germans are great people for "sounding" foreign markets. That is what they are doing here at this very moment.

By the time the results of these "soundings" reach the Fatherland, conditions here or economic, especially labor conditions at home may have undergone such changes that all plans must be altered or dropped. Potential foreign competition may, however, have this beneficial result that in times of strenuous demand when runaway market conditions develop only too easily and frequently, the spectre of importations will prevent prices from over-inflation. Prevailing levels show virtually no change.

Pig Iron.—Pending the development of demand for fourth-quarter shipments, the market rules quiet but steady with No. 2 foundry quoted at $19, valley furnace. Automotive foundries are buying in a routine way.

Aluminum.—Norwegian shipments of aluminum to the United States have made possible the doubling of production in that country over last year. More than one-half of the Norwegian output is shipped to the United States, and of this the domestic producer is the heaviest taker. Meanwhile aluminum originating in Canada where the American producer has a subsidiary plant, is offered in the London market at prices below those quoted for British ingots. Sizable quantities of aluminum have arrived lately consigned to a New York banking house with Swiss affiliations. The domestic producer is seemingly striving for greater production facilities.

Copper.—Progress in the Dawes negotiations imparted a strong tone to the copper market. Wrought copper and brass products are equally strong.

Calendar

SHOWS

Oct. 21-27—Transportation Show, Motor Truck Industries, Inc., American Exposition Palace, Chicago.

Nov. 9-15—New York, Annual Automobile Salon, Commodore Hotel.

Nov. 10-15—Chicago, Annual Show and Convention of the Automotive Equipment Association, Coliseum.

Jan. 2-10—New York, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Bronx Armory. Trade attendance only, Jan. 2-3.

Jan. 23-31—Chicago, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Coliseum and First Regiment Armory. Trade attendance only, Jan. 23-24.

Jan. 25-31—Chicago, Annual Automobile Salon.

FOREIGN SHOWS

Aug. 23 - Sept. 2—Bratislava, Slovakia, International Danube Fair.

Aug. 23-Sept. 6—Toronto, Ont., National Automobile Show in conjunction with the Canadian National Exhibition under the sanction of the Canadian Automotive Equipment Association and the Automotive Industries of Canada.

September—Vienna, Austria, Vienna International Fair.

Sept. 13—Sao Paulo, Brazil, Annual Automobile Show.

Sept. 21-28—Prague, Czecho-Slovakia, Prague Autumn Fair.

Oct. 2-5—Dantzig, Second International Dantzig Fair, automobiles and allied equipment.

Oct. 2-12—Paris, passenger cars, motor cycles, bicycles and accessories, Grand Palais.

Oct. 17-25—London, Annual Passenger Car Show, Olympia.

Oct. 22-31—Paris, motor trucks, stationary engines, garage tools and machine tools, Grand Palais.

Nov. 9-19—Buenos Aires, Annual Automobile Show, Pabellon de las Rosas, under the auspices of the Automovil Club Argentino.

Dec. 1-13—Montevideo, Uruguay—Second Annual Motor Show, under the auspices of the Centro Automovilista del Uruguay, held in buildings of the Asociacion Rural del Uruguay.

RACES

Sept. 1—Altoona.

Sept. 1—Syracuse.

Sept. 7—Monza Track, near Milan, Italy, Italian Grand Prix.

Oct. 2-4—Dayton, Ohio, Fifth Airplane Race for the Pulitzer Trophy.

Oct. 4—Fresno.

Oct. 19—Kansas City.

Nov. 24—Los Angeles.

CONVENTIONS

Sept. 17-20—White Sulphur Springs, W. Va., Annual Meeting of the Automotive Electric Association, Greenbrier Hotel.

Sept. 19-20—Niagara Falls, N. Y., National Battery Manufacturers Association.

Sept. 22-26—Boston, Sixth Convention and International Steel Exposition of the American Society for Steel Treating.

Oct. 16-18—Briarcliff Manor, N. Y., Semi-Annual Meeting of the American Gear Manufacturers Association, Briarcliff Lodge.

Jan. 5—New York, Convention under the auspices of the National Automobile Dealers Association, Hotel Commodore.

Jan. 26-29—Chicago, Eighth Annual Convention of the National Automobile Dealers Association, Hotel LaSalle.

S. A. E. MEETINGS

September—New York City, S.A.E. Automotive Transportation Meeting.

Oct. 21-24—S. A. E Production Meeting, Detroit.

Nov. 18-19—Joint Service Meeting of the S. A. E. with the N. A. C. C. Cleveland.

Oct. 26—Aeronautical Meeting at Dayton at the time of the Pulitzer Races.

January—S. A. E. Annual Meeting, Detroit.

Sales Conditions

(*Conditions in other cities on pages* 298 *and* 299)

Minneapolis

MINNEAPOLIS, Aug. 4—In every way the outlook for the automobile business in this territory is encouraging. Harvesting has been completed in certain grains. Other crops will pan out well generally, barring possible storm damage.

The Minnesota agricultural industry is prophesied at $600,000,000 gross, which is $100,000,000 better than the income of 1923. Other States have good prospects, in some instances exceptional.

The first step following the sale by the farmer of the present crop at prevailing high prices will naturally be the liquidation of debts, which will put the banks and business generally in better condition, and pave the way for a return of the normal conditions of pre-war years.

Although the farmer has not yet completed his harvesting, he is beginning to interest himself in automobiles. Country bank deposits in the Twin Cities are rising, which is an indication of returning prosperity rurally. Distributors are reporting renewed interest in the territory on the part of dealers.

Detroit

DETROIT, Aug. 4—Sales of new cars in Detroit during July totaled 5889, an increase of 143 over June and an increase of about 400 over sales in the same month last year. The gain over June business is somewhat of a reversal over the usual yearly business cycle as in July last year retail sales fell off 2000 from the June total. The gain this year is due in a large measure to the introduction of new models which in several prominent lines came a month earlier this year than formerly.

In the city the flow of retail sales is continuing steadily and is being accomplished with little or no pressure from the factories. Conditions in the State are much slower than in Detroit, particularly in the industrial centers. Farm buying has not developed to a point yet as to create any particular volume of sales, but dealers find all the signs favorable for good buying later.

New York

NEW YORK, Aug. 4—While the majority of distributors and dealers in the Metropolitan area found July no better than June, there are some whose sales bulked bigger, although not by very large margins. One of the "big five" was well satisfied to have July come within 10 per cent of June.

On the other hand, another one of the leaders had a better July than June, while his July was 100 per cent better in a retail way than July, 1923. All agree, however, that things are on the mend, that the public's scare is over and a normal business may be looked for from now until winter.

Atlanta

ATLANTA, GA., Aug. 4—Automobile sales by dealers and distributors in the Atlanta territory during July again ran below the total volume of business experienced during the corresponding month last year, but compared with some of the earlier months of 1924 proved to be on a fairly satisfactory basis. There is, however, room for a considerable improvement in practically all parts of the South.

The used car problem continues to be one of the serious ones faced by the industry in this section.

Dealers and distributors are optimistic over the late summer and fall outlook, as cotton prices have climbed above 30 cents per pound and there is promise of an excellent volume of business in districts where cotton crops are marketed.

Toledo

TOLEDO, Aug. 4—While sales have not been running as high in the Toledo territory as they did a year ago, it is estimated that dealer stocks of new cars are about sufficient for 15 days' business.

Sales in June were off about 26 per cent as compared with a year ago and in July down about 24 per cent. The used car situation remains very good in Toledo. Stocks run about 20 cars to the dealer.

Farm conditions, showing rapid improvement, are expected here to have a good effect in the next few weeks when farmers will be marketing the grain that is just in harvest now.

Louisville

LOUISVILLE, Aug. 4—Business in sales during July showed a daily average considerably better than is usual for mid-summer, and in fact better than the earlier months of this year during which the peak ordinarily appears. In the last few weeks a gratifying rise in the open car sales curve was noted.

Kansas City

KANSAS CITY, MO., Aug. 4—Agricultural conditions are so extraordinarily good, with crops actually produced being not only large but of good quality, and bringing good prices that prosperity seems right at hand. Sales of passenger cars in July were 20 to 40 per cent below last year.